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ABSTRACT

An international seminar on in-service education of science teachers was held in Czechoslovakia in 1983 and was attended by educational experts from eight countries. Representatives from the Soviet Union, the Polish People's Republic, the Bulgarian People's Republic, the German Democratic Republic, the Federal Republic of Germany, India, Colombia, and Tunisia participated in the seminar. The proceedings focused on: (1) the aims and didactic concepts of the lifelong education of teachers of selected science subjects; (2) the implementation of the concept of the lifelong education of these teachers; and (3) the possibility of cooperation in inservice programs on a regional and international scale. A listing of recommendations that were made at the seminar is provided. Also included is a list of the seminar's participants, its program, and selected bibliographic notes. (ML)

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# IN-SERVICE EDUCATION OF SCIENCE TEACHERS

Proceedings of International Seminar

Bratislava, October 17-21, 1983

Charles University

Prague

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# 1 INTRODUCTION

The International Seminar on In-Service Education of Science Teachers was held on the campus of Bratislava Comenius University from October 17-21, 1983. The Seminar was held under the auspices of the Rector of Comenius University prof. PhDr. Ján Kvasnička, DrSc., and was organized by the European Information Centre of Charles University for Further Education of Teachers in Prague in close collaboration with the Faculty of Science of Comenius University in Bratislava. The Seminar was one of the initiatives of the Czechoslovak Socialist Republic with regard to the fulfilment of the Unesco Programme for the period 1981 - 1983.

The proceedings of the Seminar were focused mainly on:

- the aims and didactic concepts of the lifelong education of teachers of selected science subjects: chemistry, biology, geography and geology,
- the implementation of the concept of the lifelong education of these teachers,
- the possibility of cooperation in the optimization of the in-service education of these teachers on a regional and international scale.

The conference languages were Czech, Slovak, Russian, English and French.

The International Seminar was attended by 13 specialists from 8 countries of the European region, and three guests from the developing countries /see List of participants - Supplement No 1/. Taking part were experts from the Soviet Union, the Polish People's Republic, the Bulgarian People's Republic, the German Democratic Republic, the Federal Republic of Germany, India, Colombia and Tunisia. The host country was represented by 53 experts, mainly faculty staff and personnel of regional pedagogical institutes. The Seminar was attended by Doc. PhDr. Ladislav Šmíd, CSc., Secretary General of the Czechoslovak Commission for Unesco.

The deliberations of the Seminar proceeded in an atmosphere of friendly exchange of information and views, in the spirit of the third part of the Final Act of the 1975 Helsinki Agreements on Security and Cooperation in Europe, as well as in the spirit of the Unesco Recommendation Concerning Education for International Understanding, Cooperation and Peace and Education Relating to Human Rights and Fundamental Freedoms /1974/.

Within the framework of the analysis of the trends of the development and the current state of in-service teacher education in the given area the participants expressed their views on the further development of in-service education of science teachers in the 1980's and 1990's. Certain open questions of the general development of in-service education were also discussed.

The deliberations of the Seminar proceeded according to the Programme /see Supplement No. 2/.

## 2 SELECTION OF PRESENTED PAPERS

## 2.1 OPENING ADDRESSES

The Seminar was opened in October 17, 1983 at 2 p.m. by Doc. JUDr. S. Petráček, CSc. The participants then heard addresses by Prof. Ing. J. Marton, CSc., the representative of the Ministry of Education of the Slovak Socialist Republic, Prof. PhDr. J. Kvasnička, DrSc., Rector of Comenius University in Bratislava and by Doc. PhDr. L. Šmíd, CSc., Secretary General of the Czechoslovak Commission for Unesco.

### 2.1.1 Prof. Ing. J. M a r t o n , CSc.:

Dear Comrades, Ladies and Gentlemen,

I am very glad to be able to cordially welcome you on behalf of the Ministry of Education of the Slovak Socialist Republic on the important occasion of this scientific seminar. We are all convinced that we are witnessing a period of rapidly advancing progress in science and technology not only in this country but in the whole world and especially in the industrially advanced countries. Scientific and technical progress is placing increasing demands on the overall educational level of society and on higher qualification in all fields of human activity. The precondition of further scientific and technical development, of progress in thinking and of the rate of development of living standards is the continuous rise in the standards of the educational process. These factors are driving force which leads to the deepening of the educational system, to the development of training for qualified work, and for the development of formal and non-formal educational activities. The effective use of the

latest knowledge of science and technology is indispensable.

Present pedagogy attributes the decisive role in the educational process to the teacher. In the period of changes in science and technology increased demands are being placed on the teacher this not only on the broadening, deepening and upgrading of his own educational standards but also on the development of his personality and on his ability to control the pedagogical process and to purposefully use all educational factors. In view of the continuous development of the natural sciences and of related technical development education and the consistent acquisition of new knowledge by every person should be considered to be natural. In educators this process is absolutely inevitable and highly demanding mainly because the educator must cope with it on a much higher professional level. The teacher is not merely a consumer of new ideas, knowledge or technical progress but also their direct mediator and disseminator. He must therefore learn and acquire new knowledge in such a manner as to be able to access and transmit it to others.

In every state and nation the educational process is a key question which directly and indirectly affects culture, as well as the technical, economic and social levels of the population. As such it must keep up with cultural, scientific and technical progress. Regardless of adjustments or reforms of the educational system the teacher remains its main realizer and thereby also the most important factor. The teacher´s education and training for this responsible function is a long term matter. The creation of a favourable school environment is a very important condition for meeting growing demands on the work of the teacher. A creatively and initiatively working teachers´ collective enhances the mutual exchange of informat on, exactingness, the exchange of progressive experiences, mainly with subject teaching methods. The very nature of the societal complexity of the teacher´s work leads to a deeper differentiation of the teacher´s position in education, to a new structure of pedagogical professions and to their optimal categorization. In the Czechoslovak Socialist Republic fundamental changes have taken place in the educational system in connection with the adoption of the document on "Further Development of the Czechoslovak Educational System"passed by the

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Proceedings of International Seminar

Bratislava, October 17-21, 1983

Edited by

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TO THE EDUCATIONAL RESOURCES INFORMATION CENTER (ERIC)."

government of the Czechoslovak Socialist Republic as early as in 1976. The Document deals with the long-term structural and content changes in the Czechoslovak educational system which in the target stage are to create conditions for attaining secondary level education and for reaching the initial stage of lifelong education by all citizens. Teacher education in Czechoslovakia is an important component of the allround harmonious development of the personality of the socialist teacher. It helps achieve the basic aims of our society as set for the education of the young generation by the XVIth Congress of the Communist Party of Czechoslovakia.

In-service teacher education contributes towards raising the teachers' political, specialist and cultural level. In-service teacher education is therefore part of the societal educational system which follows up on the education provided to future teachers at institutions of higher education. For these reasons and in linkage with the tasks which follow for Czechoslovakia from the Final Act of the Conference on Security and Cooperation in Europe for education and culture and from the tasks which follow from the 3rd Conference of Ministers of Education of the European Countries as well as from the Coordinating Consultative Meeting of delegations of National Commissions for Unesco of countries of the socialist community Czechoslovakia decided to convene an international seminar devoted to the problem area: "In-Service Education of Science Teachers".

I would like to express the wish that this seminar should become a dignified contribution towards deepening cooperation between the nations of the world for increasing the living standards of the working people.

2.1.2 Prof. Dr. J. K v a s n i č k a , DrSc.:

Dear Comrades,
Ladies and Gentlemen,
Dear Guests,

I am glad to be able to welcome you on behalf of the administration of the oldest institution of Higher Education in Slovakia - Comenius University, Holder of the Order of the Republic. We consider it to be an honour that our science faculty together with the European Information Centre of Charles University for Further Education of Teachers has been authorized to organize this international Unesco event. We view this as an appretiation of what our faculty has done in the field which is to be discussed at our Seminar. I believe that apart from this joy there are several other positive ideas which should be expressed here. We consider it to be a matter of course that in the Czechoslovak Socialist Republic we are living in the period of the scientific revolution. It is a matter of discussion as to whether this is the initial stage of this revolution or whether this revolution is already under way. We consider it to be a matter of course even though this is not so everywhere in the world. In our conditions this puts certain demands on institutions, mainly on those which have a highly humane mission, namely to be the cradle of science, the forge of science and education.

As concerns the in-service education of teachers, namely the teachers of science subjects this has a very specific accent. Many of us will know the letter written by V. I. Lenin long before the October Revolution to the Party School in Capri, when the Bolsheviks could not yet even dream that one day they would be taking over power. Even then there were certain ideas, plans, strategy, tactics, namely that the quality of every school is not primarily determined by curricula, plans, teaching aids, no matter how important, but first and foremost by the quality of the teacher, his moral human profile. This applies to an increasing extent to science teachers because natural sciences as is well known form the theoretical foundation of the technical sciences and of technics in general. And this today is the determining factor of the further development of the production forces and production relations, of social progress in general. In the conditions of the socialist society the natural sciences have their specific function, they form the material basis of the world opinion of the adolescent and the adult person.

I believe that this Seminar will become a positive step

forward in the field which it is to discuss, that the discussion will be factual, friendly, in the spirit of mutual tolerance and mutual understanding, that its participants will take home with them from Comenius University in Bratislava the best of impressions.

Allow me therefore to wish all participants in the Seminar a pleasant sojourn, fruitfully spent hours and days and to thank the organizers of this important event for all that they have done so far. I believe that the proceedings will be smooth and faultless.

Welcome among friends.

2.1.3 Doc. Dr. L. Š m í d , CSc.:

Dear Foreign Delegates, Comrades,

Allow me to welcome you on behalf of the Czechoslovak Commission for Unesco and to wish this international Seminar which is being held under the auspices of this international organization full success. Unesco which is one of the most significant organizations of the UN system fully reflects the current trend of the rapidly growing importance of science in the life of society - this has already been stated here.

The conceptual plan of Unesco up to the end of the 1980's therefore includes several broadly conceived interdisciplinary programmes in the field of scientific research and instruction of science fields, their interlinkage and their socioeconomic dimensions. At present the organization is discussing the programme and draft budget for the years 1984 - 1985. The 22nd Unesco General Conference which opens next week is to discuss and adopt this programme. The draft of this programme devotes considerable attention to the problem area of science, its research and instruction. Concrete programmes which are being suggested are aimed at enhancing the quality and modernizing the instruction of scientific disciplines and technologies through experimental projects, i.e., model projects, experiments and research, the accelerated application of the results of such

activities in this field, in the method and content of instruction at all school levels, as well as in non-formal education and the linkage of this activity, that is the linkage of research and instruction of science disciplines as part of the education system with programmes of national development as well as the broader accessing of the results of this activity.

Our Commission for Unesco is devoting concentrated attention to this field of Unesco activity in cooperation with the respective universities and academies of sciences. We are developing broad international cooperation, namely with the developing countries. This is illustrated by the fact that since 1964 we have in the Czechoslovak Socialist Republic been organizing post-graduate study courses for young scientists from the developing countries in highly specialized fields of the natural sciences; namely microbiology, macromolecular chemistry, analytical chemistry, the chemical methods of biological prospecting, hydrology. We also grant scholarships to teachers of agriculture schools. These post-graduate study courses are very important and their orientation, i.e., the very subject area of these study courses, shows that for many developing countries they may have key importance for further development. Apart from that we participate in a number of intergovernmental programmes organized throught Unesco, such as Man and Biosphere, the International Biology Correlations, the International Hydrological Programme, etc.

Allow me, Dear Foreign Delegates, Comrades, to close by expressing my conviction that this international Seminar will be a successful contribution to the Unesco mission for which this organization was established, namely, to quote from the Unesco Constitution: towards "Strengthening peace and international security by developing cooperation in education, science, culture and information."

## 2.2 THE KEYNOTE PAPER

Prof. RNDr. L. M e l i o r i s , DrSc., Vice-Rector of Comenius University:

The task and aims of the education of science teachers

Our contemporary period, i.e., the contemporary period of the whole civilized world, is characterized on the one hand by the implementation of the latest scientific and technical knowledge in social production and on the other hand by the emphasis put on the so-called human factor in the process of the development of society: the scientific and technical revolution is turning in a direction which corresponds to the needs and interests of man.

The allround and rapid developmnet of life is also putting new and more exacting demands on the scientific, specialist and moral maturity of every human being, this in all spheres of social practice. Allround education and high qualification of all working people is increasingly being required. The optimal development of all members of society and the optimal social use of their intellectual and physical potential is becoming the significant, fundamental condition for increasing social production and the development of other fields of the life of society.

The development of the production forces on the basis of the latest knowledge of science and technology is accompanied by increased demands on the general and specialist knowledge of man as the subject of working activity. The growth of productivity and the rise of the living standard depend to a considerable extent on the level and quality of human work, on the work of man as the aware, creative subject of material and spiritual values of society, on the level of man´s activity.

The advance of scientific and technical development arouses the need of the rapid adaptation of man to changing working requirements and conditions of the working process. The formation of the necessary qualities which enable such adaptation is in many ways dependent on the allround development of the personality. Contributory in this respect is for instance the continuously rising level of general and polytechnical education and the newly conceived specialist education, the optimal development of man's intellectual abilities. The advance of scientific and technical development also places on man other more exacting demands, e.g., to adequately withstand and respond to demanding work loads, to take decisions independently and quickly, to find an orientation in the dynamics of the working activity and the working process, to creatively initiate the work in the collective, to deal with people and to manage working collectives, to simultaneously control an increasing number of objects, to increase demands on the speed of direct action in working activities. Education in the whole school sector secures the provision of the foundations of professional training and actual vocational training. The inculcation of habits of independent work and the ability to continuously and constantly educate oneself represents a significant innovation factor through which scientific and technical knowledge is transmitted into social practice.

The primary task of the school is to teach future specialists to think independently and creatively, to inculcate in them the desire and ability for self-education, to teach them to update and develop their professional and general knowledge.

In connection with the development of society and increasing demands on the education of teachers basic changes are being made in the school, in educational systems, in pedagogical theory and in educational practice.

These changes are implemented through the activity of the teacher whose role in the educational process remains irreplaceable. The teacher is the decisive factor in contemporary school, he is the principal factor of the educational process which objectively reflects the needs of society. The growing demands on the work of the teacher are inevitable, are related to the growing demands on the allround development of the personality, on

the character of his work and life. However, the demands placed on the work of the teacher are much higher than those placed on any other profession. The dominant task of contemporary teachers is to develop the creative abilities of the pupils, to prepare them in such a manner as to make them capable of active work in society, to make them capable of coping always and adequately with all circumstances of their working assignment. This requires much knowledge, versatile abilities and extraordinary qualities of the personality of every teacher.

The personality of the pupil - the future worker develops in the educational process, his needs and demands, his active creative participation in the material and spiritual creation of social life increase. The impacts of the individual educational factors change. Teachers much more often than ever before are overcoming the unfavourable educational impact of the environment and are ever more profoundly oriented to the latest achievements of science and scientific and technical progress. This in general increases demands on the qualification of all educationalists. The exactingness and content of the teacher´s work are changing substantially, because we are no longer concerned with the traditional transmission of a set of notions at different levels of generality and concreteness but with a completely new quality - the allround purposeful development of the pupil´s personality.

An important precondition for meeting the rising demands on the work of teachers is the creation of a creative atmosphere in the school which enhances demanding pedagogical work of individuals and collectives. The creatively and innovatively working teaching collective will enhance the mutual exchange of information, exactingness, the transmission of progressive experience, mainly related to the theory of instruction and the methodology of the individual subjects. The increase in the social complexity of the teacher´s work leads to a profound differentiation of the position of the teacher in education and to a new structure of pedagogical professions and their optimal categorization.

In the Czechoslovak Socialist Republic fundamental changes have taken place in the educational system in connection with the adoption of the document relating to "The Further Development of the Czechoslovak Educational System" adopted by the Government

in 1976. The Document projects long-term structural changes in the Czechoslovak educational system whose final objective is to create preconditions for attaining secondary education as the start of the life-long education of all citizens.

In connection with the Document and the follow-up Decrees and measures all efforts of contemporary school are primarily oriented to raising the effectiveness of education and deepening the democratization of education in our country.

An integral part of the new concept of the educational system is the life-long education of teachers and educational personnel forming an open and dynamic system. In this sphere there are, however, many problems which have to be theoretically and practically resolved. These open questions include e.g. the in-service education of science teachers which is the content of our international seminar but also in-service education of other categories and degrees of teachers. As has been stated in the content orientation of our Seminar we shall primarily be concerned with the clarification of the aims, tasks and organization of the in-service education of science teachers, the optimization of this educational process and the possibilities of scientific research and pedagogical cooperation in the solution of these tasks.

## A. NEW CONCEPT OF EDUCATION OF EDUCATIONAL PERSONNEL

### I n t r o d u c t i o n

In accordance with the mentioned Document on "The Further Development of the Czechoslovak Educational System" allround education of teachers of indiviudal study fields is deepened in all principal components of their higher education. New effective forms are improved and verified of the linkage of the theoretical and practical aspects of this higher education, also improved is the selection of basic subject matter of the individual subjects, of the syllabi and the mutual interdisciplinary linkage and inter-relation of subjects. The content of this education is resolved in connection with the improved form of syllabi and educational media for basic and secondary schools, especially

for secondary vocational education. Progressively resolved are the content of the system of practicals and their organization in coordination with education authorities. Specific is the education of teachers for the first /elementary/ level of basic school, i.e., grades 1 - 4, the training of teachers of general educational subjects for the second level of basic school and for secondary schools, the new broad profile of the teacher-instructor is being observed.

The gradual enforcement of the principles of the new concept of the training of teachers of basic /main/ subjects which is undergoing significant changes is significantly characterized by the integrated approach to equal education of teachrs for the second level of basic school and for all types of secondary school. In theory and in practice greater care and attention is being devoted to deepening the professional pedagogical qualification of graduates.

The science subjects: geography, chemistry and biology are studied at Czechoslovak institutions of higher education in the following combinations: mathematics - geography, mathematics - chemistry, physical training - geography, physical training - biology, mathematics - biology, physics - chemistry, biology - - chemistry, Russian - geography. In view of the low number of teaching at basic and secondary school geology is not studied as a separate subject in combination with another subject but is incorporated within biology and geography.

## Unified system of in-service teacher education

The continuously rising demands on the teacher's profile have required an improvement in the quality not only of the postgraduate stage of education but also of in-service education. This is implemented in the sense of the Document through Decrees issued in 1977 by the Ministry of Education on the unified system of in-service education of teachers and other educational personnel and under Directives issued in 1979 by the Ministry of Education related to this Decree on the induction of beginning teachers.

The individual types of voluntary specialized study contribute to the further pedagogical and specialized growth of teachers, they develop their pedagogical creativity and deepen their education according to the needs of the school and according to their individual interests.

Significant in the system of the in-service education of teachers is continuous education which is designated for all categories of educational workers and is organized in parallel with other types of this education. It acquaints the teacher and other educational personnel with current topical questions and implementation tasks related to the further development of the Czechoslovak educational system, with changes in the content and organization of instruction, with experience gained by teachers and other educational personnel, in harmony with the needs of society and scientific and technical progress. The system of the in-service education of teachers and other personnel has been proven, there is no need to make any basic changes, it is, however, necessary to specify concrete measures for improving its quality and raising its effectiveness.

Primarily we shall be concerned with the innovation of compulsory types of in-service teacher education and with securing its unification on the whole territory of the Czechoslovak Socialist Republic. Attention will also in the future be devoted to the development and quality choice of new subject matter for post-graduate education and for other forms of study within the framework of the in-service education of teachers, the creation and quality of the respective study literature, the independent creative work and self-education of teachers.

Constant attention is being devoted to the long-term concept of the ideological and political education of teachers which in the close linkage between the school and social practice of the construction of socialism in this country creates conditions for the ideological and political growth of teachers.

The qualification education of teachers in the individual categories of educational personnel is being linked ever closer with the system of the adequate in-service education of teachers whose content is the deepening of new requirements in education according to the school level and type and the innovated content

of subject instruction.

Experience with the implementation of the system of the in-service education of teachers has shown that its individual forms and levels allow the attainment of the basic objective of in-service teacher education, namely to secure the harmonious development of educational personnel according to the changing needs of society and according to the needs of the personal development of educational personnel. The content of the individual levels, types and forms of the in-service education of teachers is conceived in such a manner as to secure differentiated professional needs - professional adaptation, requalification, updating, upgrading, innovation and specialization of the content of education and the broadening of pedagogical qualification. Of the implemented forms of in-service teacher education the following forms have been highly successful:
induction of beginning teachers,
specialized study,
the actual form of teacher training for the new concept of education and teaching at basic schools.

Each level of this education has a clear and irreplaceable function, oriented to the ever more intensive development of the initiative and self-education of teachers.

This system provides, in continuity with initial pre-graduate higher education, a socially effective method of the gradual improvement and deepening of the unity of ideological and political maturity and communist morale, allround pedagogical qualification and the high level of acquired specialization of teachers and educators throughout the whole period from graduation to retirement. We are thus concerned with the life-long education of teachers which in our progressive educational tradition finds currently applicable stimuli in the work of Comenius after whom Bratislava university is named. He was the first to lay the general foundations to the concept of systematic life-long education.

## System of evaluation in teacher education

The system of social evaluation following up on the unified

system of the in-service education of teachers is becoming an important social instrument for upgrading and raising the effectiveness of the work of educational personnel. It is its task to complexly evaluate and verify at set time intervals the qualification of the educational worker to perform pedagogical work according to the requirements of pedagogical practice, in accordance with the state of development of science, technology and culture and on the basis of the evaluation of attained results to help the educational worker to upgrade and raise the effectiveness of his work.

The system of social evaluation is also an effective means of forming pedagogical collectives, schools and school educational facilities. As such it is an integral component of the allround social care of the teacher and of other educational personnel and contributes towards creating conditions for their responsible work.

The system of social evaluation is implemented by complex evaluation usually at five year intervals.

## B. INSTITUTIONS PROVIDING IN-SERVICE EDUCATION OF TEACHERS

Regional pedagogical institutes and district pedagogical centres have under Acts of Law adopted by the Czech National Council and the Slovak National Council in 1978 become part of the Czechoslovak educational system as educational institutions specializing in the in-service education of teachers and other educational personnel. Institutes for the Education of Educational Personnel were established in Prague and in Bratislava /central institutes/ to secure the fulfilment of tasks related to the in-service education of teachers and educational personnel in the sector of education. Institutes for the development of higher education are preparing for the fulfilment of tasks related to in-service and further education of faculty staff.

The implementation of the unified system of the in-service education of educational personnel in the sector of education is the responsibility of authorized educational institutions, namely district pedagogical centres and regional pedagogical institutes. In the sense of the Decree issued by the Ministry of

Education concerning the unified system of the in-service ecudation of educational personnel the implementation of the system will involve institutions of higher education and secondary technical schools, possibly other specialized and scientific institutions.

The need of a creative and purposeful solution of topical educational problems and the indispensability of providing pedagogical personnel with assistance in this solution has made it necessary for all schools and educational institutions to partake of the in-service education of educational personnel in a more explicit and more organized manner and they cooperate in this respect with the respective public and economic organizations, out-of-school cultural educational and information institutions. Secondary schools, for instance, provide methodological and specialized assistance to educational personnel in close cooperation with the respective works committee of the Revolutionary Trade Union Movement, primarily through meetings of pedagogical councils, methodical commissions at schools and special educational actions for educational personnel, including the induction of beginning teachers and ideological and political education.

Specialized institutions for the in-service education of educational personnel are differentiated according to the regional or sector competence into district pedagogical centres, regional pedagogical institutes, central institutes for the education of educational personnel. They study the state and problems of pedagogical work at schools and on the basis of the state and latest development of scientific and technical knowledge, they provide specialized help to educational personnel, they organize educational actions for educationalists in compliance with the Decrees of the Ministry of Education.

Secondary schools and institutions of higher education provide mainly post-secondary and post-graduate study courses for educational personnel, possibly also organize other specialized forms of in-service education of educational personnel, provide specialized assistance to specialized institutions for the in-service education of educational personnel in organizing more demanding forms of in-service education. Institutions of higher education should study the needs and deployment of gra-

duates in pedagogical practice and closely cooperate with other specialized educational institutions. They should participate in the work of commissions for qualifications validation which organize post-secondary and post-graduate study courses; they should provide necessary personnel and material and technical conditions for successful passing the validation examinations of study courses attendees.

Cultural educational institutions, public and hobby organizations should organize educational activities and cooperate with educationalists in accordance with eleborated plans. Significant media for in-service education of educational personnel are the press, radio and television, this mainly because they provide prompt information, and secure a unified approach to and concept of in-service education of educational personnel and enhance the organization of exacting educational cycles.

The educational authorities establish specialized units for the solution of personnel problems of educational personnel, complexly secure and control the system of in-service education of educational personnel as a significant component of personnel work.

In order to secure the high standard, effectiveness, organic linkage, continuity and coordination of initial training and the unified system of in-service education of educational personnel and its individual forms specialized advisory bodies and specialized commissions for solving the tasks of the in-service education of educational personnel are being set up at all levels of administration. The departments of education of national committees set up commissions for qualification validation and control their activity.

## C. EXPERIENCE WITH THE IN-SERVICE EDUCATION OF SCIENCE TEACHERS BY POST-GRADUATE EDUCATION

### Ratio of subjects of specialization

The education of teachers in day study courses in the past was often ruled by frequently changing curricula and changing subject combinations which were marked by the respective period

of time. Post-graduate science teacher education must therefore complete many basic data in many disciplines which either in the past were not taught at all or in which syllabi differed from from one type of faculty to another /pedagogical faculty, science faculty or other/. Past teacher education and its level lacked uniformity to such extent that the post-graduate course attendees' knowledge differed in level. The lack of uniformity of initial education further increased with attendance at various forms of in-service teacher education courses. The ratio of specialization subjects was not clear for a long time. Views were voiced that in post-graduate education one of the specialization subjects could be considered as the main subject /and would also be the subject of the dissertation/ and the second would be the minor subject. We believe that for the optimization of post-graduate education it is necessary to have two subjects in the specialization on an equal basis.

## Content of the in-service education of teachers in post-graduate education

The content of post-graduate education is most frequently criticized because colleges of higher education have adapted it to their conditions, e.g., they have disproportionately extended those disciplines for whose instruction they had good educators. Thus unnecessary details were often taught in certain areas which were not needed for instruction at general educational schools. It is obvious that the teacher must have a broader outlook in his specialization than is prescribed by the curriculum. However, the desirable relations must be observed.

The syllabi of post-graduate education should include topical themes corresponding to the current trend of the respective science discipline. Thus, for instance, in connection with the increasingly urgent and widely discussed questions of the moulding and control of the environment we believe that this problem area should be integrated in the content of the post-graduate education of science teachers. Similarly, the regional aspects of the teachers' educational practice comes to the fore

in the post-graduate education of science teachers. The teacher should become well acquainted with the area of his school from the point of view of his specialization in such a manner as to be able to successfully use this knowledge in the educational process, e.g., during excursions with pupils to the natural environment, the collection of natural material, nature protection and conservation, etc.

## Organization of post-graduate education

Many good intentions can often not be implemented owing to many problems resulting from the organization of post-graduate education. Our experience has shown that it is necessary to concentrate mainly on the choice of faculty staff working in field of post-graduate education, the organization of consultations and summer camps and on problems related to study literature.

### Choice of faculty staff working in post-graduate education

Appointed to post-graduate education should be the best members of faculty staff and practitioners. The problem is often discussed whether the same teachers should teach in initial and post-graduate study courses or whether post-graduates should be taught by someone else /a specialist/. This teacher may follow up on his previous lectures but it often occurs that he will present his lecture covering a similar area without the necessary innovations. The specialist often has no great knowledge of school practice and will present a lecture which has no connection with the needs of the school. The problem must be resolved in dependence on the development of new curricula which should not be crumbled into short specialized lectures but should comprise bigger units. Next to the specialized aspect they should also comprise the aspect of specialized didactics. This could reduce the number of lecturers and would enhance interdisciplinary relations. Also welcome would be cooperation with school practitioners, i.e., with outstanding faculty staff.

### Consultations or summer camps

We do not have the best of experiences with consultations in post-graduate education. The attendees usually come together and the consultation tends to turn into a lecture. Attendance at consultations rarely exceeds 50 %. The reasons differ: many teachers have not been released by school principals, they had serious personal problems for which they were unable to attend. In many instances the reason for their absence was the distance between their school and the institution of higher education where they attended their post-graduate study course. We therefore believe that if consultations are to be included in post-graduate education it will be necessary to set up a larger number of consultation centres, minimally within the framework of each region.

Better experience has been gained with summer camps organized within post-graduate education which make good use of practicals and where consultations are often organized outside of the set plan /in the students' leisure time/.

Views of summer camps differ. This depends on whether they are evaluated by the faculty, the employer or the student. Most students appreciate the camp because it relieves them of travelling to the university fro consultations, and they do not have to pay the relatively high costs of travel and accommodation. The employers are usually more critical in their opinions on summer camps.

We shall therefore have to give priority to summer camps before consultations in the new syllabi because we want to see the student of the post-graduate study course thoroughly concentrated on his work, we want him to have such conditions as would allow the mutual exchange of experience and we also want the Decree of the Ministry of Education on non-interference with school instruction observed. The demands placed by the school administration in the past were unambiguous - to reduce consultations during the semester and to maximally use the school and university vacations for this purpose. During the summer camp it is possible to maximally use the laboratories and other facilities of the respective institution of higher education as well as its accommodation facilities. This will make post-graduate education highly effective and will greatly reduce its costs

for the students.

In connection with the implementation of summer camps at the institution of higher education it will, however, be necessary to complete the respective prescriptions on the right to paid leave in respect to both the students and the faculty staff taking part in the summer camp and the reimburseement of faculty staff teaching in post-graduate study courses.

Study literature and aids

The basis for successful post-graduate education is the availability of sufficient suitable and easily accessible and didactically valuable literature. Each attendee of postgraduate study courses should automatically be provided with study literature which complies with the curriculum. This literature should be published in advance and should be innovated in desirable time intervals. This literature should be published in close cooperation and coordination of the respective faculties responsible for post-graduate education.

C o n c l u s i o n

We have touched on certain problems relating to the in-service education of teachers in general and the in-service education of science teachers in particular. The presented paper should become an introduction to the proceedings of our seminar which will certainly specify many problems which have been indicated here and will complete them, drawing from the experience of participants from home and abroad.

The successful and effective in-service education of science teachers depends not only on the content of this education, not only on its organization but primarily on the moral maturity and level of the attendees. The role of the teachers in the changing world, i.e., in the changing economic, political and social conditions is increasing in importance and the teacher as the basic factor of the educational process remains irreplaceable even in the period of unprecedented scientific and technical development. The teacher must be appropriately prepared for this role and a thoroughly processed system of in-service teacher education must

significantly contribute to this permanent education not only as an updating factor but also as a factor which motivates creative activity and responsible self-education.

## 2.3 INTRODUCTORY PAPERS

Introductory papers were delivered by the representatives of the organizing institution Doc. JUDr. S. Petráček, CSc., Director, and PhDr. H. Procházková, Deputy Director of EIC-FET, then by the representatives of the Central Institutes for Teacher education in Bratislava and Prague, PhDr. A. Auxt and Doc. RNDr. J. Macek, CSc.

### 2.3.1 Doc. JUDr. S. P e t r á č e k , CSc.: World Problems and the Content of In-Service Education of Science Teachers

We are approaching the turn of the millenium. Many of us, as we know from our own experience, view the year 2000 as a symbol of radical changes in our life. Realistically minded people, and by their erudition science teachers belong among such people, see, however, that big changes are already taking place today and will take place on our planet even before the year 2000. This postulate may be borne out by at least three facts:

First: the continuously deepening political, economic and cultural crisis in numerous countries of the world which is a source of various difficulties and conflicts whose consequences threaten the positive development of human society.

Second: the destabilizing effect of the situation in international politics and in the military field which is posing a grave threat to world peace and to the peace coexistence of countries with different socio-economic social systems.

Third: a further wave of scientific and technical development mainly characterized by the development of microelectronics which leads to the introduction of qualitatively higher level technology into the working and production process in a situation when a considerable part of humankind has not yet been able to adapt to present day advanced technology.

The overwhelming majority of humankind clearly understands that if the current trend of development should continue there will inevitably follow destruction on an unprecedented scale. Therefore only one development alternative is optimal: to comprehend the current situation, to systematically reveal the sources and causes of danger threatening humankind, to eliminate this danger by mutual cooperation and to control and master the changes which are being enforced in such a manner as to make them proceed to the benefit of humankind.

The recognition of world problems and the possibility of their solution as well as the use of these possibilities must become one of the integral components of in-service education of teachers in general and science teachers in particular. Expecially two of the well-known and interconnected world problems have become absolutely fundamental for human future and for the survival of the human race: the safeguarding of world peace and thereby the elimination of the risk of self-destruction and the implementation of measures which will preclude an ecological disaster and will allow the creation and protection of our environment. This will in turn make it possible for an ever greater number of people to live on this planet enjoying a decent standart of living.

The responsibility of science teachers for education for international cooperation, mutual understanding and peace, for education relating to human rights and fundamental freedoms is evident, because using their extensive knowledge and experiences they are able to help prove that our generation is able to resolve outstanding world problems, that we have sufficient information, knowledge, material and financial sources which could change the current situation and thus contribute to the further development of humankind.

The science teacher /the teachers of physics, biology,

chemistry, geography and geology/ is best able to imagine the immensurable consequences of the use of nuclear, biological and chemical weapons and will understand that even if we do not take into consideration the possible use of these monstrous means of mass extermination there exist other fields of human activity which pose not only a direct danger to the development of the human society but that there are also harmful processes and situations which disturb the positive development of human society, lead man astray and destroy his environment.

Thus, for instance, the capitalist industrial society is developing its industrial production in dimensions which by far exceed real social and individual needs. The consequence of this trend is the growing wastage of irreplaceable raw materials and of the work of a large number of people. Advertisement and fashion lead man to use items which are by far not necessary for his existence and force him to be an endless consumer. More is produced for people to consume, more and more is consumed in order to increase production. Every geology teacher could point out how many raw materials are unnecessarily exploited and how many of them are irreplaceable now or in the near future.

What has briefly been outlined is an example of the totality of factors influencing the content of the in-service education of science teachers. By being very close to the rational understanding of the said phenomena these teachers can within the framework of their educational function effectively help seek an answer to the question of what are real human needs, how to act responsibly with regard to future generations and how to help create the criteria determining the quality of human life and the vision of the further development of man and humankind in general.

Dear colleagues, in the next few days you shall be exchanging views on how best to educate teachers of selected science subjects and thus to improve the quality of the educational process at different levels and types of institutions of the educational system, including adult education. It is logical that your discussion will be oriented primarily to the specific aspects of upgrading instruction in the individual science subjects - I would like to ask you to devote adequate attention to problems which

I have indicated and which must necessarily influence the concept of in-service education of science teachers - this is certainly the requirement of our time.

We believe that in the said context this will mean to devote adequate attention to at least to the following questions:

- Questions related to the prospect of the peaceful development of the human society, i.e., the question of peace and war. This comprises the problem of integrating the principles of education for peace and disarmament, internationally accepted in the form of the Unesco Recommendation of 1974 and the conclusions of the Unesco Intergovernmental Conference held in Paris on the same theme in 1983 in the in-service education of science teachers and in instruction in science subjects.
- Questions related to man's impact on nature, i.e., the control of nature and coexistence with it. This will mainly concern the integration of the principles of environmental education in the in-service education of science teachers in the sense of internationally accepted principles, such as the conclusions of the world conference on environmental education held in Tbilisi in 1977.
- The broad complex of questions related to the problems of teaching what the individual wishes and what the individual should know, this in relation to both the in-service education of individual science teachers and in relation to the instruction of students.
- Questions of generalizing the advance of science, technology, and as a matter of fact also of art /world culture/ in the in-service education of science teachers and in instruction in these subjects.
- Questions related to the everyday life of man, the problems of the quality of life, the quality of the life style, to make it successful, happy, valuable, for man not to live only to want to have something but to live to want to be something.
- Questions of life-long education in the natural sciences this in relation to the in-service education of science teachers, in relation to upgrading instruction in these subjects and in relation to adult education.

This basically means to constantly have in mind in our con-

siderations that in-service education has two broad components - general and professional. These components are not totally different but they are inter-related and inter-active, any concept of in-service education must respect this fact if it is to fulfil its important social function.

Teachers of biology, chemistry, geology and geography from different countries of the European region and also from other regions of the world, from countries with different socio-economic orientations have met for the first time to jointly assess the concept of in-service education of teachers of selected science subjects and fields and to discuss the possibilities of optimizing this type of education. I believe that the results of the international seminar will show how to further raise the adaptibility and innovatory function of teachers of science subjects through in-service education, how to emphasise the corrective function of their in-service education and to fulfil the basic function of in-service education, i.e., to maintain and upgrade the standards of educational work in science subjects.

2.3.2 PhDr. H. P r o c h á z k o v á

Place of Information in the In-service Education of Science Teachers

The purpose of my paper is to recall certain important aspects of the life-long education of educational personnel, such as is related to their work with information sources and the use of information systems. Noone today doubts the rising importance of informatics in science and technology; its impact is penetrating education. It has to be used at the right time and in the right place. Thus, for instance, in the development of programmes of in-service education the fact must be taken into account that the period of the so-called information revolution places high demands on science teachers, such as follow from the specific characteristics of this profession, namely:
1. the exponential growth of information in the natural sciences

and its reflection on contents and on methods of education,
2. the rapid development of both information and educational technology and the impact of the mass media on education,
3. the contradiction between the offer of information systems, and of information services in the place of the teacher´s work and the information needs of the teacher´s qualification and educational practice,
4. the complexity of the process of the communication of specialist information on the level of the teaching profession owing to its interdisciplinary character, namely along the margin of the teacher´s subject specialization and pedagogy,
5. the irreplaceable role of the teacher as the methodologist in the education of pupils for independent work with information sources, information seeking and use, this in relation with his own user skills.

Information specialists and educationalists have dealt with some aspects of this problem but it has not been studied in its entirety. In practice neither educational information systems which mainly serve educational research and/or school administration nor science information systems /which mostly do not follow the problems of education and the interlinkages between practical applications/ are oriented to the teacher.

It has been found on an international scale that teachers´ information needs have not been appropriately studied even though this user category is the broadest, most numerous and most costly item of educational systems and a significant factor in educational innovations and reforms. Serving teachers are usually not even provided with appropriate services of specialized information centres like their colleagues in other fields of social activity.

Moreover, during their pre-service and in-service education teachers are usually not adequately prepared for the effective use of existing information services nor for their own work with information. The fact that this is a global problem relating to all fields and educational systems in all countries is borne out by the interest of Unesco which within the framework of UNISIST devotes attention to the problems of the education of users of scientific a technological information, methods of planning its implementation at national level and the education of teachers

for its introduction.

The concept of training information skills proceeds from the following social interests:

- the accessibility of information is the right of all citizens which should be informed of this right through information education,
- information systems would be ineffective if they were not fully used; adequate education tranforms potential users of these systems into real users,
- life-long education is the desirable social goal which may be given considerable endorsement by training in information use.

The integration of training information skills into the system of in-service teacher education should as a result of the better use of information have effect on raising the efficiency of their self-education and creative work.

The importance of information for scientific and technological development and the indispensable economical use of resources lead educational authorities to consider the rational management of educational and scientific activity, mainly at higher education level. With this is connected training information skills in the following situations: preparation for instruction, problem educational situations, launching research projects, writing publications or text-books, meetings with foreign colleagues, attendance at conferences, moderating discussions, seminars, etc., compiling analytical studies, evaluating new technology, personal bibliography, knowledge of authors who have cited them, and many others.

The introduction of information technology into schools also requires that the teaching profession be defined with regard to the various possibilities of the educational use of information and that demands be drawn up which should be placed on models of in-service teacher education both within the school and in the process of the teachers' life-long education. Information technology in education not only facilitates the management of the entire educational system but also allows the interlinkage of the educational system with data bases outside the school. Those interested in the training for the use of such facilities include not only the field of education but also the operators

of information systems and data base producers. Various international organizations have studied possibilities of improving information education. As an example let me mention the European Association of Scientific Information Dissemination Centres /EUSIDIC/ which publishes guide-books for on-line use of data bases.

The international seminar of teachers of information theory and practice from member countries of the International Centre for Scientific and Technical Information /MCNTI/ also discussed problems related to education for the use of international and and national branch information systems /Warsaw, 1979/. Special attention was devoted to the questions of educating users for independent retrieval of information in the dialogue system /contribution of the USSR/. According to the plan of development of the International System of Scientific and Technological In-Formation /MSNTI/ the network of computerized information centres which allow direct access to data bases via satellite will be extended in the 1980's. This project is to be implemented on a decentralized basis in the individual MSNTI member countries according to a unified programme and methodology.

The International Conference on Informatics Management /EURIM 3, Munich 1978/ was devoted to the problems of the contribution of users to planning and policy making for information systems and networks - a survey was presented and information training for the use of on-line systems in Europe was evaluated. The conference stated that there exists a considerable need of rationalization and cooperation in the field of education for the effective use of these services. There is a number of fields for such cooperation, namely in the use of publishing text-books of information methodology, the production of audiovisual aids, writing demonstration programmes and other media, especially for self-instruction. Broader cooperation can also meet the demand for study courses which are independent of concrete commercial systems by providing an adequate conceptual basis for the generalization of experience, methodology and psychology related to the use of information technology.

Next to the said general conferences, study courses and aids for the direct use of automated data bases, there are the

training opportunities and handbooks offered by agencies. They contain both the theory and application of the respective information systems and practical exercises - this is for instance the handbook published by the DIALOG agency. The users are thus able to understand both the content specialization of data bases, by their fields of specialization, by types of sources or their provenance, as well as the method used by individual information systems by their operating rules of dialogue, this regardless of their commercial affiliation.

Bibliographic data bases usable by science teachers are accessed in form of printed abstract or index periodicals which from the point of view of promptness of information accessing are a somewhat cumbersone information service, moreover are mediated by the distribution network of the book market and the lending system of conventional libraries. SDI /selective dissemination of information/ provides greater promptness and relevance. This service provides continuous batches of secondary information on sources through printouts from information system outputs according to user profiles. The most operative is the on-line system through which the user, possibly with the assistance of an information specialist, may specify his search query in a dialogue with the system.

Higher education information centres with terminals for faculty staff, research and instruction, providing their users with methodological aids and organizing training programmes are either being introduced in institutions of higher education or are already in operation and in some cases already provide generalized didactical experiences to others. Thus, for instance, the Newcastle Polytechnic has published the chemistry information learning package. This package contains a handbook for teachers, a text-book for students, audiovisual programmes, prospectuses and questionnaires.

On the example of the project "System of Scientific Information" of Charles University in Prague we shall demonstrate how the use of data bases is being developed for science teachers in the Czechoslovak Socialist Republic. The accessibility of the terminal line which is the indispensable link between computer and reprographic technology has been provided by the government

Decree of 1980. This has made it possible to hook the system to the line Moscow - Prague - Vienna designed for the on-line transmission of scientific and technological information. At the same time a licence agreement was signed with the Swiss information service DATASTAR in Bern which provides access to 17 foreign data bases. The Ministry of Education of the Czech Socialist Republic, under an agreement with the Central Technical Base as the central guarantor of all branch information systems will allow Charles University within the framework of the System of Scientific Information to introduce on-line search services and will also provide methodological assistance to user institutions. The whole faculty of Charles University were the first to take part in an excursion to the Central Technical Base.

With regard to content orientation for science teachers internationally accessible data bases may be classified into:

a/ specialist: chemistry, e.g. CHEMABS /Chemical Abstracts/,
biology, e.g. BIOSIS /Biosciences Information Service/,
geology, e.g. GEOREF /American Geological Institute/;

b/ multi- and inter-disciplinary;
- NTIS /National Technical Information Service/,
- PASCALINE /Programme Appliqué à la Sélection et à la Compilation Automatique de la Litterature du Centre de Documentation Scientifique et Technique du CNRS/,
- SCISEARCH /Science Citation Index + Current Contents;

c/ educational: ERIC /Educational Resources Information Centre/,
EUDISED /European Documentation and Information System for Education/,
IBEDOC /International Bureau of Education/.

The IBE system is generally oriented to the educational system and international cooperation in this field, EUDISED operates on the branch principle of filing information on the basis of the selection made by the individual national centres, ERIC combines central coordination and technical processing and the decentralized system of branch centres for information selection

and analysis, this not only from the USA but from the whole world, based on English. It should be noted that among the almost 20 centres which operate as clearinghouses there is also one for the subject area science, mathematics and environmental education. Next to bibliographic services within the whole system in the said area it also publishes teaching and learning aids, conference materials, progress reports and surveys on research which is going on in the given field.

The European Information Centre of Charles University for Further Education of Teachers cooperates with the said systems on the basis of reciprocity which is made possible by the bilingual /Russian - English/ production of its publications and their international distribution. Acquired information and documentation is accessed to active users, especially in the socialist countries, and mediates the inputting of their national production to the said macrosystems. Under a contact with Unesco it is preparing abstracts for the IBE in Geneva and its own bibliographic publications are acquired by ERIC for its microfiche files and abstract journals which have world-wide circulation.

The aspects of selection and critical analysis of information must be applied to the use of services of western information services. This to a great extent concerns the natural sciences and their applications. Much information provided by these systems is irrelevant for well-known reasons /commercial overestimation, the concealment of the hazardousness of certain substances, the strategy of providing cloudy information on the exploitation of resources, etc./. All this only increases the importance of the information qualification of the teacher not only as the user of information but mainly as the adviser and methodologist of students for their work with information sources and systems this not only with regard to information retrieval but also information assessment and mainly the correct practical use of acquired knowledge.

All this is well-known and is being discussed at various forms - along the line of information science, pedagogy and the natural and technical sciences. In the decision-making process it is, however, often very difficult to maintain the correct inter-disciplinary approach. We recall this to make sure that

the conclusions and recommendations of this seminar should reflect all aspects of the optimization of in-service education of science teachers, i.e., that an adequate part of these recommentations should also relate to requirements for the cooperation of the respective information systems with the field of education, the needs of teachers to reach the appropriate information level as part of their professional qualification and finally their responsibility for the orientation of the young generation in the world of the information revolution.

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2.3.3 PhDr. A. A u x t

## In-Service Teacher Education and its Developmental Trend in the Czechoslovak Socialist Republic

The idea of in-service teacher education is not a new one and has been with us practically since the very beginning of the systematic specialized education of teachers, yet today, at the time of profound changes in modern society characterized by social progress and the scientific and technical revolution it is becoming ever more important, urgent and indispensable.

The tasks of in-service teacher education have to be fulfilled on a completely new, qualitatively different and higher level and they are therefore highly exacting tasks which exceed demands placed on the work of the school so far and on the work of every teacher. Only such educators will be able to fulfil these tasks who will be provided with allround education and who will continuously upgrade their education. The demands placed by society on the education of the young generation allow us to express the principles underlying the profiling of the personality of the socialist teacher, to define the content of his education and the scope of his training. These principles are expressed in the project of the new educational system, namely in the section devoted to the personality of the teacher. From these principles we can derive and formulate four basic demands placed on the content of the education of educational personnel.

These demands involve: - the function of the teacher as educator,
- a high level of education,
- educational foresight,
- social involvement.

The demand that the teacher should fulfil the function of an educator expresses the historical transformation of the mission and activity of the teacher and educational worker. The traditional idea of the teacher being responsible for instruction and for the intellectual development of pupils is a matter of the past and will not hold in confrontation with the demands of social and scientific and technical development. The growing number of pupils and their long-term stay in the school increases the societal responsibility of teachers for the education of youth.

Educationalists are gradually becoming the principal social partner of young people. Only such teachers-educators can at present be effective and vital social factors who through their specialization and personal participation in the whole life of young people form their personality in the spirit of communist ideology.

The requirement of a high level of education of educational personnel has in our society been implemented since the very establishment of the socialist state and personnel and material conditions are gradually being formed for its implementation. The functional character of the education of educational personnel has to be put in the forefront. It is therefore of primary importance that the teacher should come to know the importance of science and the arts for the life orientation of man and for the formation of his personality and that he should acquire an education which will be adequate to the level of development of the respective science, such as he will be able to fully use in his work in the school.

The demand for educational foresight expresses the social need that teacher education should be ahead of the present and that it should prepare the permanent development of the school system. Young teachers should, despite their difficulties as beginners, be pioneers of progressive pedagogical ideas and methods.

The demand for social involvement is a generally recognized demand placed on the teacher´s work but it has so far not been implemented to desirable extent in teacher education and the orientation of this involvement has not as yet always been quite clear.

It should be said that demands on the content of the education of new teachers have thus been formulated in practically all socialist countries. Their concrete and rapid implementation at institutions of higher education training for the teaching profession as well as in the whole system of in-service teacher education will upgrade the educational process in its entirety.

Currently there appear to be a considerable amount of unused possibilities in both pre-graduate and post-graduate education. Since 1975, under an instruction issued by the Ministry of Education, a one-year induction period has been introduced and with it the systematic monitoring of the level of beginning teachers.

We have now reached the final stage and we are writing the final report on the results of this survey which will be discussed at the operative consultative meeting of the Minister of Education of the Slovak Socialist Republic in November 1983. With regard to the said demands and to the demands stated in the Document there appear to be considerable gaps in teacher education. Most graduates have not even formed an idea of how to teach their own subject. A comparison made of the demands placed by society, the work of the teacher in formal and non-formal practice and the curriculum of teacher education has unambiguously shown that teacher education places main emphasis on the subject while the other aspects are pushed into the background. The curricula still do not provide training for all activities which are required by present day school. It appears that it is necessary to consistently reassess even the content of education in the individual subjects. The trend tc pack into subject teaching as much as possible of the respective system of the respective science does not seem to be a good idea. The statement made by Academician Kolmogorov that the present training of future teachers is almost a "process of two oblivions" appears to be generally valid. The secondary school graduate when he enrolls in university is asked to forget everything he has learned in secondary school because he is now to study university level mathematics, physics, biology, etc. and when on graduation he begins his teaching career he has to forget all he has learnt at university and starts to prepare for instruction in secondary school subject matter. The development of didactical systems of individual subjects, not the establishment of analogical "miniscience systems" now appears to offer a solution to the given problems.

Every society is concerned with its future generation because the future of the nation rests on the young generation - thus the interest of our socialist society in teacher education is only natural. In his address to the 1979 National Teachers' Conference Comrade Havlín, Secretary of the Central Committee of the Communist Party of Czechoslovakia, said: "The formation of the personality of the socialist teacher begins with orienting the interest of young people to the teaching profession, continues with their correct selection, quality allround training at institutions

of higher education to life-long education."

It unambiguously ensues that there must exist a control system providing life-long political and specialized development of the teacher with the aim of strengthening the gained specialization at higher education level to comply with new situations and the ensuing social demands which are specific for the respective developmental stage of social development.

Demands placed on teacher education are high but they follow from real possibilities which comprise: the present level of the teaching profession, the network of schools and installations for teacher education, the organization and administration of the educational system, the scientific and material backing of the educational process.

The present level of the instuction process may be characterized as the first stage or the postulate of the innovation process. The ever more explicit and systematic integration of elements of problem instruction, the more purposeful methodological integration of motivation, teachning and learning aids and the more explicit activity of pupils are proof to the fact that the results of research related to the theory of instruction and educational psychology are gradually penetrating into the work of our teachers. This is the result of the work of regional educational institutes, specialized educational journals and publications, as well as of the independent study and experimental work of the teachers themselves.

The moral and political and professional qualities of our teachers are an important guarantee for coping with the demanding tasks set to the educational system. They are a continuation of the progressive and revolutionary tradition of the teaching profession in the class struggle of the working class and the communist party in the bourgeois system, in the anti-fascist struggle and in the Slovak National Uprising. We consider the involvement of teachers in building our socialist present, its political, organizational, party, cultural, enlightenment, scientific, fields, etc. to be proof of the high political level of the teaching profession.

The teaching profession has always been organically linked with social and scientific progress. Therefore Slovak institut-

ions of higher education, namely pedagogical schools and scientific institutes established in the 1950's found able cadres in the ranks of teachers. Today the scientific and functional promotion of teachers is natural. Teachers have always been the cadre basis for institutions providing in-service teacher education - namely regional educational institutes, district educational centres, which since their establishment have ever more purposefully been orienting their activity.

Teacher education is a natural condition of the self-realization of the teacher in the educational process and it was therefore organized at appropriate level ever since the establishment of socialist education. The reconstruction of the Czechoslovak educational system analogically requires the reconstruction of the content of teacher education. The reconstruction of the forms and content of teacher education is taking place within their preparation for the new educational process. The urgency of the task requires rapid solutions. The introduction of the new programme in grades 1 - 4 of primary school and the introduction of the educational programme in nursery schools bears out the successfull fulfilment of tasks set to teacher education. According to programme the retraining of teachers of the second level of basic school has ended and the retraining has begun of teachers in all three existing streams of secondary education.

The planned and yet speedy education of teachers was frought with problems which the teachers had to cope with. This may lead us to believe that the introduction of the new system of education will end the process of the education of teachers or that it will at least be followed by a period of relaxation which allows for "complacency and passivity". The successful implementation of the content reconstruction is in fact only the beginning of a new quality. "Insofar as education is a process and a long-term process, it is necessary in the education of teachers to create a system securing the flexible and effective training of the teacher for the fulfilment of tasks in the given period of development of society. Thus, the education of the teacher for a new system of education must be conceived as one form of the complex process of implementing the reconstruction of our education and not an extensive and yet single action." The process

character of teacher education requires the establishment of a system which will safeguard consistency, the qualitative upgrading of education and will at the same time use the continuity of the impact of all elements which partake of education. Such a system enters the field of teacher education for the first time with the Decree of the Ministry of Education of the Slovak Socialist Republic no 80/1977 on the Unified System of In-Service Education of School Teachers Providing Basic, Secondary and Higher Education and other Educational Personnel.

2.3.4 Doc. RNDr. J. M a c e k , CSc.:
System of In-Service Teacher Education in the Czechoslovak Socialist Republic and its Application to Science Subjects

The unified system of the life-long education of educational personnel was legislatively arranged in the Czechoslovak Socialist Republic by the two national ministries of education in 1977. From this norm are derived all components of the in-service education of educational personnel. The in-service education of science teachers proceeds from the general system of in-service education of teachers in general but has certain specific aspects as concerns the application of the individual forms and methods of work. First I shall therefore say a few words about the general aspects and institutionalization of the function of the system and then I shall apply this knowledge to our problem area.

The system of in-service education which immediately follows up on pre-service teacher education at higher education level consists of three stages:
- the induction of beginning teachers,
- post-graduate study courses,
- specialization study.

At any time the serving teacher may be involved in what is called continuous in-service education which in this period of the pre-

paration for the new concept of work at secondary school level is of immense importance as we shall see.

Induction of beginning teachers: takes one year and is implemented during the first year of service. Responsible for it are regional pedagogical institutes and school heads. It is compulsory and is completed with an interview.

Post-graduate study is implemented at the respective institution of higher education between the 6th and 10th years of service. It is compulsory, takes two years and is completed with an examination and final thesis. The curricula of the post-graduate study course are developed by institutions of higher education in cooperation with the central institutes for the education of educational personnel and are approved by the ministries of education of the Czech and Slovak Socialist Republics.

Specialization study usually also takes two years, is optional and may be implemented at central institutes for the education of educational personnel, at institutions of higher education, in regional pedagogical institutes and in institutes of the Czechoslovak Academy of Sciences. It is completed with a written thesis and an interview and follows up on the previous stages of in-service education.

The above characteristic of the different stages of in-service teacher education indicates that they considerably differ in content. Induction is mainly oriented to methodology /subject-teaching/ problems and is aimed at acquainting the teacher with the practice of the given school or secondary school stream, in post-graduate study specialized and didactics innovations and methodology innovations come to the forefront. The induction period may be used for acquainting the young teacher with regional specificities, to show him the technical possibilities of science instruction in the given condition. In post-graduate study courses it is possible to transmit to teacher general information on novelties in all disciplines of his specialization and to enable him to selectively deepen his knowledge of the given discipline. This possibility stands out in specialization study which is usually narrowly oriented to some part of a discipline or to a novel problem area and provides the opportunity for deeper study. This type of education is most explicitly

oriented to the specificity of the respective science discipline and the study which the teacher chooses on a voluntary basis usually best meets his personal interests. Specialization study is not an end in itself. The graduates of these study courses become very useful helpers in the in-service education of other educational personnel, they lead methodological groups, partake of regional research, etc. The authority of the teacher increases with the deepening of his specialist knowledge and skills, the teacher's personal interests are satisfied. The study also becomes a road to scientific and research work, a basis for the development of educational creativity. The preparation of pedagogical readings /independent essays written by teachers generalizing their empirical knowledge/ or the preparation of teaching aids also belong in the category of the third stage of in-service teacher education.

The same stage also includes the so-called functional study of methodologists of regional pedagogical institutes in which these educationalists prepare for their methodological work in the education of other educational personnel of the region. This functional education is compulsory for all who hold the respective post. We are now trying this type of education for methodologists of chemistry and physics and we shall inform you of the details in the respective sessions of this seminar.

It should be added that for school administrators /school heads and inspectors/ functional education is also compulsory and is recurrent every five years.

The development of science subjcts requires regular specialized innovations in the respective field. We can assume that every teacher independently studies the literature of that discipline which is closest to him. For his school practice he will indispensably need to know about scientific developments in all disciplines of his specialization. We therefore publish comprehensive study materials in cooperation with the respective institutions of higher education which are to provide the teachers with suitable texts for independent study. So far we have published specialized innovations texts related to the preparation of teachers for the new concept of educational work at secondary school level, we are planning to publish such ma-

terials again after a period of five years.

Science teachers need not only specialized innovation but also need to train new skills and to acquire new skills, namely in connection with the introduction of new laboratory methods or procedures, the implementation of research results in school instruction, the introduction of new school aids, etc. It is therefore necessary to incorporate into all stages of in-service education not only lectures and seminars but also practical training, field work, excursions, etc. enabling also the exchange of experience and thereby informal aid to less experienced teachers and to teachers with less drive. Such forms are very important in specialized study. The experience which we have gained so far with the study of organic chemistry and biochemistry and with environmental education show that there is great interest among teachers in such new approaches to problems and in the practical study of new methods.

Continuous in-service education may be introduced by regional pedagogical institutes or district pedagogical centres at any time during the teachers' serving life. Such forms of in-service education include acquainting teachers with new basic educational documents, such as curricula and syllabi, with new textbooks and teaching aids. This form of in-service education is coming to the fore at secondary level now because it helps teachers become acquainted with the new concept of secondary education and to prepare them for the introduction of new educational work in different grades of secondary school. This type of education has therefore been declared compulsory and temporarily replaces post-graduate in-service education. We have therefore also for the time being limited specialization study courses for secondary school teachers and we have restricted ourselves to continuous in-service education for primary school teachers and to running experimental study courses of environmental education which on our initiative was discussed by the Unesco regional seminar on environmental education in 1980 and recommended for introduction. It is oriented to teachers of science subjects at basic school /primary/ level and at secondary level, at secondary schools for nurses, to school administrators and to personnel of national committees. Its scope exceeds 200 hours of consultations. Study

courses for 20 - 36 attendees which for practicals split up into smaller groups have proven very useful. The experiences gained with these study courses which are being implemented in cooperation with the Institute of Applied Ecology and Ecotechnology of the Prague University of Agriculture in Kostelec nad Černými Lesy are very good and there is great interest in attendance of future runs.

As concerns the possibilities of in-service education in science we must not forget that the new concept of subjects is also becoming part of the information provided during the functional schooling of school administrators.

The unified system of in-service education of educational personnel could not be secured without institutional safeguards. This institutional system is headed by central institutes for the education of educational personnel in Prague and in Bratislava which methodologically control regional installations, namely regional pedagogical institutes which employ one methodologist for each subject. The regional institutes in turn control district pedagogical centres. At all levels of in-service education there is cooperation with the respective institutions of higher education in the respective region and elsewhere.

The costs expended by our State on the in-service education of educational personnel are considerable. All study materials are provided free of charge, the costs of seminars and block courses and travel expenses are considerable. This, however, we find is returned multifold in deepening the educational work of the school.

The experience with the preparation of educational personnel for the new concept of educational work in our schools is used for improving the system. Work on the project has not ended with the development of new curricula and syllabi. The working groups continue in their work and are now orienting their work to the development of the educational creativity of the teacher.

The project of the further development of the Czechoslovak educational system, party and State documents emphasise the irreplaceability of the teacher in the introduction of the new concept of work.

We are therefore also gradually innovating post-graduate

in-service education at institutions of higher education, we shall deepen and extend the possibilities of specialization study. We shall discuss this at greater length in the respective sessions of this seminar.

All work with young people and their teachers and instructors would be futile if in-service teacher education courses, especially for science teachers, were to fail to consistently and continuously emphasise the question of the struggle for peace and a healthy environment. Only in peace does our work have any sense, only for peace and a healthy future of humankind do we intend to educate our new generations.

## 2.4 SELECTION OF PAPERS PRESENTED BY FOREIGN PARTICIPANTS

The following foreign participants presented papers in the plenary session of the international seminar: V. A. Baykova /USSR/, W. Bünder /FRG/, I. N. Petkova /Bulgarian PR/, L. Genkova /Bulgarian PR/, H. Obst /GDR/, D. Lahiry /India/, R. Tobon /Colombia/, A. H. Fekih /Tunisia/. The names of the speakers are listed without titles and posts, see List of participants, Supplement No 1.

We are now presenting a selection of the most important points made in these papers and communications:

2.4.1 V. A. B a y k o v a in the introduction of her paper On the In-Service Education of Science Teachers in the Byelorussian SSR informed the participants in the Seminar of the system of in-service education of teachers in her country. This system is implemented by Institutes for the In-Service Education of Teachers /the republican institute, six regional institutes, the municipal institute in Minsk and district and municipal methodology centres.

The basic form of in-service education is training provided by study courses which are attended by practically all serving teachers within a period of five years. Institutes plan and set up study groups which are differentiated by the length of service, by the level of education which the teacher has acquired, by working conditions. The study course length also differs by the number of attendees from two weeks to two months.

The republican institute has developed model thematic curricula for these courses to help regional institutes. These programmes incorporate problems of educational psychology and metho-

dology, the questions of the theory and method of subject instruction. A considerable part of instruction time is devoted to seminars and practicals, laboratory practicals are included. For village teachers whose work has many specificities /teachers teach more than one subject, there limitations to professional connections between teachers, etc./ the Institute organizes both day /full-time/ and distance /part-time/ study courses. The structure of study courses includes the following forms: lectures, seminars, practicals, scientific practical conferences, individual and group work, practice teaching in selected schools, consultations. Every form has its practical importance, it is not isolated but is closely linked with the other forms. Lectures are the basic form. By character they are not informatively instructive but emphasise problem methodology.

The success of in-service education of educational personnel depends on qualified tutors. This is enhanced by the cooperation between the Institute for In-Service Education and institutions of higher education. Doctors and candidates of sciences are involved as lecturers in scientific conferences, seminars, etc.

The activation of the teaching process in study courses for in-service teacher education helps form the need of self--instruction in the attendees.

Appropriate attention is devoted to the questions of the work of beginning teachers. Teachers attend study courses three years after graduation. On the programme of their first year of service are lessons of practice teaching under the guidance of experienced teachers.

In conclusion the delegate stressed that in the field of in-service teacher education there still remain a number of outstanding problems which will have to be resolved. Experiences gained with study courses should be disseminated, it is necessary to care for the health of the attendees. In a number of places in the Byelorussian Soviet Socialist Republic prophylactic sanatoria operate within institutes for in-service teacher education. It is also necessary to improve the process of in-service education of teachers in small village schools, to increase the effectiveness of the work of subject methodology associations, to extend the existing forms of self-instruction and to establish

a closed cycle of life-long education of educational personnel.

2.4.2 W. B ü n d e r of the Federal Republic of Germany in his paper discussed the Development and Application of Teacher Education in the Federal Republic of Germany. He said that the Federal Republic of Germany is a federation of 11 states - a fact which becomes especially noticeable in the area of education. Each state is autonomous with regard to its educational policy. Cooperation and coordination are, to a great extent, voluntary. The standing Conference of the Minister of Education which meets once a month and whose decisions have to be unanimous is a necessary part of this coordination and cooperation. After 1945 the school system in West Germany was for the most part adopted without any external changes. The traditional three--stream school system was taken over: Volksschule /primary school/, middle school and Gymnasium. These three school forms are still very evident today. Teacher training was also conducted along the lines of these three school forms.

At the end of the 1960's there were several educational movements in the country, such as the educational economics movement, the emancipating movement which agreed that the school system and teacher training were no longer in keeping with the social problems of the period. The school reform began with the Social Democrats' assumption of power. A visible result of this reform is the introduction of the comprehensive school, a school which is horizontally streamed and hopes to remove the traditional vertical streaming. Teacher training is not training for a certain type of school but rather for a certain school or age level. All teacher training takes place at a university /teacher colleges are usually affiliated with the universities/. This training takes 6 - 8 semesters. At the primary or secondary I levels main emphasis is on educational science and didactics whereas the secondary II level training is focused on the subjects - usually two.

W. Bünder focused his attention on in-service education of teachers in the Federal Republic of Germany. Teacher educat-

ion in the FRG is conceived as the unification of three different phases: 1. pre-service education /6 - 8 semesters/,
2. induction phase /3 - 4 semesters/,
3. in-service education - life-long education.

In-service teacher training in the Federal Republic of Germany has moved more and more in the direction of professionalization and institutionalization. Professionalization in this case is conceived in connection with the professionalization of the teacher, as an orientation in subject areas and a limitation of the goal-setting throught a description of the professional tasks. Institutionalization is conceived as "a coagulation of the fluid life in fixed cultural forms". This process of coagulation is exhibited in in-service teacher training in the Federal Republic of Germany through the formation of organizational structures within a larger differentiated system in which there are relatively concrete function relationships with the respective institutions. This development will probably not be completed within the next five years. At present there is a transition phase in which the older structures of in-service training have increasingly disappeared while new forms and objectives have not yet been fully developed. This is a period of discussions on the goals, forms, experiences, structures and efficiency of in-service teacher training. The current problem of in-service teacher education is the systematic study of different study courses. W. Bünder presented detailed information on one such investigation.

The investigation framework of this study can be characterized by the tension between external institutionalization of in-service teacher training and internal professionalization. On the one hand in recent years institutions for teacher education have been founded in practically all federal states. In part the establishment of these state institutions is still in progress. The focal point of these new institutions are small regional branches which serve to maintain an in-service educational network. On the other hand, the objectives, tasks, procedures, i.e., the professional tasks are by no means so clear.

The study was focused on three main areas:

1. Characteristics of the in-service trainers in the field of science.

2. Goals and didactical concepts of the trainers.
3. The practice of the trainer in his/her in-service courses.

The addressees of the study were in-service trainers who had taught in in-service training courses in the natural sciences /biology, chemistry, physics, elementary school science/ in the years 1977 - 1978. O the 305 questionnaires which were distributed 162 were returned and could be analysed. This made up a sufficiently large sample for making empirical statements. Among the respondents 92 % were men and 8 % were women.

Ad 1. The findings present a differentiated picture of the "typical trainer" in the field of science. Most of the women respondents were employed full-time in the schools, more than 90 % indicated that their activity in in-service education was less than half-time. Only 16 % of the courses were conducted by full-time teacher trainers. More than 80 % of the courses were conducted by persons who were employed full-time by the schools. The time spent in in-service training ranged from 1 day to 80 days per year. The average was 14 days. In summary one may say, said W. Bünder, that teacher in-service training in the fields of science is mainly conducted by teachers; in second place one finds university staff members and full-time teacher trainers. The in-service training institutes provide the administrative and organizational frame. They have little influence on the contents and methods used in the individual training courses: generally, these areas are the trainers' responsibility. Continual, goal-oriented further training or supervision of the majority of trainers who come from the schools is an exception to the rule. It is an important task for the central institutes to see to it that the necessary continuity and generalization of the individual experiences of the co-workers /through research/ is realized.

Ad 2. 158 of the 162 trainers who responded to the inquiry formulated a total of 546 goal statements with regard to the goals and tasks for in-service teacher training. The survey showed that there exists a relatively high level of agreement among trainers in in-service teacher education on two points: relating modern /new/ information from the subject matter and promoting the exchange of experience among the participants. At the next level entries relating to subject matter oriented didactics

followed, i.e.: subject matter oriented didactics and the reduction thereof, instructional methods and work with experiments. On the other hand there were differences in the goal statements of trainers from different job situations. Trainers who are employed full-time by the school differ from their colleagues from the university or in-service training institute. School teachers believed that the most important aspect is the exchange of experience while university staff and full-time teacher trainers considered the transmission of subject matter to be most important.

As concerns the didactical characteristics the research was oriented to their analysis according to teachers' responses. They characterized their last course by items. 112 teachers stated that two aspects suffice for describing the didactical characteristics of in-service teacher training courses, namely "the transmission of experiences" and the "transmission of knowledge". The following part of the survey was focused on finding out whether there exist "pure concepts" or mixed concepts to both above mentioned concepts. In this respects the respondents could be divided into three groups: the first group consisted of respondents who put main emphasis on the transmission of knowledge, the second group put main emphasis on joint work and the exchange of experiences among participants in such courses and the third group could not take a clear decision. It is possible that in--service teacher trainers in this group gave a low rating to these aspects because they see that their courses are oriented less formally. Ii appears that for these trainers the aspect of "training" remains in the background.

Ad 3. The aim of the survey was to obtain the most objective and least distorted idea of courses in the field of science. The teachers were asked to describe the last course either as leader or co-worker with regard to the following aspects: emphasis on subject - content, forms of work and materials /aids/.

Usually in-service teacher education of science subjects is organized for one subject /biology, physics, chemistry/. The results of the survey show that great emphasis was placed on experimenting to which almost one third of each course was devoted. Differences in emphasis as concerns the individual subjects were not found. In study courses where there was a prevalence of

teachers from other schools emphasis was put on subject teaching /didactics/.

The knowledge, attitudes and strategies for problem solving which the teachers learned in in-service teacher training courses later transmitted into their own practice. This is true of methods of instruction /forms of work/. For this reason the study dealt with forms of work and material from three aspects: the size of the group for in-service teacher training courses, forms of work, materials and aids.

The author analyses these aspects both individually and in inter-relation. The most frequent size of in-service teacher training course is a two-four member and a 15 - 30 member group. The big groups do not vary in size in the duration of the course as often as the small ones. The most frequent forms of work are discussions, debates, lectures and lecture-discourses, experiments.

Materials and aids fall into three groups: lecture scripts, work materials, the equipment used by students to perform experiments and by teachers for demonstration and teaching and learning materials with book-like character.

In conclusion the author said that with regard to the results of the study it will be necessary to continue to clarify the role of science instruction. It appears that there exists a concept of the subject which considers the natural sciences not so much as a process of knowing and methods for acquiring knowledge as a collection of scientific facts, model concepts and theories. The professionalization of the in-service education of science teachers must go hand in hand with the experiences gained by students. What is needed is the didactics of structure and process, state and motion as the basic factor of the natural sciences. Otherwise science education does not yield the required results. /Tables attached to the paper are available at the European Information Centre of Charles University for Further Education of Teachers/.

2.4.3 I. N. P e t k o v a of the Bulgarian People's Republic presented a paper On the Problems of Optimizing the Process of

In-Service Teacher Education.

The process of the in-service education of teachers is very important for resolving the problems of educational work, this even more so in the period of the reform of the educational system which is now taking place in the Bulgarian People's Republic. The problem of the self-instruction of teachers arises in connection with the influence of the scientific and technical revolution. the growth of information and the process of the rapid ageing of knowledge, she said. In this process the main role is played by in-service education and its optimization and within its framework the clarification of psychological questions. The joint work of the psychologist and methodologist allows the teacher to take a psychological and didactic approach to the problems of instruction and education. In her paper the author conceived this cooperation as the main road towards optimizing in-service teacher training. On the basis of the suggested structure of this process the author indicates the role and position of the psychologist and his cooperation with methodologists in all aspects of the qualification process. Experiences with the joint work of the psychologist and methodologist show that the attitude of the teacher to the applied forms is changing. Also changing are the practical results of the qualification process. The conclusions are elaborated on the basis of observations, inquiries, the analysis of the qualification process which was organized by the Institute for the In-Service Education of Teachers for teachers of biology, chemistry and geography. Interest in the problem follows from the author's work as teacher of chemistry and assistant professor of psychology at the department of pedagogy and psychology of the Institute for In-Service Teacher Education. Courses for in-service teacher education show that a good teacher should not only master his specialization, gain practical skills but that he also has to be able to apply the knowledge of psychology. The author believes that the underestimation of the psychological appects of teacher education is the main cause of most failures, of most bad results of teachers' work.

The problem of the optimization of teacher education requires the solution of the following problems:

- to determine the psychological, scientific and methodological

knowledge which is important for optimal qualification,
- to examine whether the teacher has acquired this knowledge and how it is used in practice,
- to elaborate rational approaches to the organization of in-service work and to clarify the conditions of correct coordination of psychology and methodology,
- to form in teachers the feeling of the need of psychological knowledge and skills and to use these skills for the solution of methodological problems,
- to determine whether the designed system of in-service teacher education provides the necessary theoretical knowledge and respective skills for the implementation of the psychological and didactical approach to the process of instruction,
- to determine the indicators of the efficiency of in-service teacher education.

The teachers themselves acknowledge that knowledge of psychology is necessary precondition of optimizing instruction and increasing its efficiency. Not all are, alas, able to correctly use this knowldge in practice. The author believes that lectures in psychology are too abstract for teachers, often descriptive, detached from real practice.

The author presented the results of a survey carried out among teachers of biology, chemistry and geography who appreciated the cooperation of the psychologist and the methodologist. Most teachers rated the creative approach as being the most important aspect. The development of the creative abilities of teachers for controlling their practical work on the basis of a knowledge of theory ranked first among priorities in the organization of psychological and methodological training.

In conclusion I. Petkova said that the survey confirmed that the clarification of the interaction of the psychologist and the methodologist in the in-service education of teachers opens new vistas for the problem of optimizing the process of in-service teacher education. Even though such forms of in-service education require more intensive work from the teachers as compared with conventional methods, in practice the teachers are then able to resolve the problems related to their role in the educational process more efficiently.

2.4.4 L. G e n k o v a of the Bulgarian People's Republic discussed The Problems of Optimizing the Content and Organization of the Educational Process.

In her paper L. Genkova said that with the development of the scientific and technical revolution grows the role and social function of education. With this is linked the question of the education of educational personnel, especially of teachers who teach the foundations of science subjects.

The system of the education of these teachers is influenced by objective and subjective factors. Objective factors include institutions which implement this process of education. Observing the set principles this education is universal, systematic, differentiated and individualized, and types of instruction include initial training, periodical and continuous education, specialization and retraining.

The subjective factors of education comprise the current trends of the development of the natural sciences at a time when the advancing process of scientific recognition of nature, the interaction of society and nature are taking place simultaneously with the development of two seemingly contradictory trends in the natural sciences, i.e., differentiation and integration. Furthermore there are the characteristics of the professional status of the teacher /diverse levels of qualification, teaching several subjects in small schools/ and the specificity of the process of cognition in science subjects where next to theoretical informative instruction the teacher also has to cope with the practical aspects of subject teaching /instruments, experiments/.

The optimization of the educational process requires activity in the following areas:

- the specification of social need and the development of reliable methodologies to determine the professional qualification level of science teachers,
- the development of a concept of optimal selection of a structure of the content of the educational process,
- the development of a concept of planning and organization of the educational process,
- the development and adoption of optimal solutions relating to

the material and technical backing of the educational process.

The Institute for In-Service Teacher Education where L. Genkova works has conducted a survey related to the problems of the optimization of the content and organization of the educational process of science teachers. The content as the basic component of the educational process to a considerable extent determines its organization and method. It has major influence on forming the personality and professional qualities of the teacher. The content of the educational process may be conceived as a complex system consisting of two interconnected components. In the hierarchy of this system are not only conventional methods of instruction but also problem lessons which better correspond to the suprastructural character of the educational process, to the cognitional characteristic of contemporary science, to integrating trends in its development. The principle of the unity of theory and practice has become the basis of the further content distribution in the structure of the educational process. The adopted structuring of the content of the educational system corresponds to the systematics of contemporary science. The theoretical cognitional complex incorporates and provides general scientific education and the cognition application complex provides activities linked with the formation of professional qualities.

The said concept of optimizing the educational process has become the basis of the unified plan for determining the content of educational programmes for teachers of different disciplines. Unified type programmes have been developed for teacher of chemistry, biology and geography which comprise the indispensable unification of subject and terminology, contribute towards overcoming narrow specialization and practicism in the work of the teachers of these subjects.

In the school year 1982-83 curricula with a higher degree of unification were experimentally introduced and two unit and three unit courses were introduced for teachers of chemistry, biology and geography.

It has become evident that the educational process has not been sufficiently investigated and processed. The essence and specificities of the educational process make it possible to monitor its organization as a state linked with the state of the

system and as an activity linked with the operation of the system.

Any improvement in planning the organization of this process is linked with the fulfilment of basic requirements such as: the existence of an information system for providing information to planning bodies /authorities/, the typification and unification of forms, the elaboration of nomenclatures and handbooks for the qualification evaluation of personnel, the respective forms of organization, control and administration, etc.

There exist two types of science teacher education: basic for the periodical compulsory updating of teachers' qualifications every five years and supplementary for the continuous education of teachers. Each of these types has forms which differ in content /complex and subject/, method of implementation /single and recurrent/ length of duration /short-term and long-term/, place and professional status of the participants.

The problem of organizing the educational process is a problem of the development and application of current planning technology. The improvement of planning technology will secure the realization of the educational process on the basis of the requirement for systematic, differentiated, individualized, meaningful and continuous education.

Every form of organization has its form of instruction. The form of instruction determines the process of the development of inter-relations and inter-action between the teacher and the student. It is determined by the following factors: content, structure, methods, material and technical factors, venue. Forms of instruction may be divided into two groups: auditory where the theoretical informative instruction is acquired /lectures, seminars, discussions - there is the trend to reduce the proportion of lectures/ and non-auditory with the prevalence of the practical and instrument-based aspects of the process of cognitition /excursions into natural surroundings, to production enterprises, laboratory practicals, field work, practice teaching/.

2.4.5 H. O b s t presented a paper related to the problem of Upgrading the Qualification of Science Teachers at the Institute for In-Service Teacher Education in Leipzig.

Progress in science exploration which follows from scientific and technical advance and the consequences thereof in the field of education and the advance of education itself, the dynamism of social development - all require continuous education of teachers; by this is meant the development of the teacher's personality, his pedagogical skills, pedagogical maturity, cultural level. In-service teacher education must give teachers the opportunity to continuously improve the quality of instruction. For every teacher in-service education is an irreplaceable source of knowledge for everyday educational work. Teachers acquire knowledge by independent study of various sources of information, primarily of specialized journals. Every teacher takes part in the work of a specialized group operating within the school or within the respective district and providing the opportunity for the exchange of experiences with colleagues. Every teacher also regularly attends updating study courses. In the course of five years every teacher will attend one basic course of civics, pedagogy and psychology and two subject /specialized/ study courses or one specialized and one subject study course. The range of every study course is approximately 30 hours and they are organized within one week during the vacations.

Programmes of study courses are developed jointly by school administrators, teachers and scientific workers. They proceed from analyses of school practice, the needs of teachers and the trends of scientific development. The drafted programmes are discussed and they are approved by the ministry of education of the GDR and then become compulsory unified programmes of in-service teacher education.

Every in-service education study course for science teachers basically incorporates one thematic unit. Since 1983 these study courses have been operating according to new programmes. Each thematic unit is subdivided into three parts which are interconnected by content:

1. specialized scientific foundations,
2. the questions of present and prospective importance of the

thematic unit for society,

3. didactical and methodological aspects of the thematic unit as implemented in lessons.

The institute for the In-service Education of Teachers in Leipzig is the centre of in-service teacher education in the German Democratic Republic. It provides in-service education in the following subjects: mathematics, physics, biology, chemistry, introduction to socialist production. The Institute organizes two week study courses for upgrading teachers' specialized, didactical and methodological qualifications. The study courses are attended by teacher-methodologists who in different districts work as advisers for subject instruction, school heads and their deputies with the respective qualification who work in this field. Attendance of the study courses upgrades the qualification of the attendees and allows them to give broader assistance to their colleagues in the latter's in-service education.

The staff of the Leipzig Institute are responsible for the content, course and organization of the study courses. The personnel of other university departments and of other institutions also help organize these study courses. They provide information on scientific knowledge thereby helping attendees of study courses to penetrate more deeply into the scientific foundations of subjects, to better understand the substance of the subject matter. The lectures are completed with excursions to selected enterprises which helps update the subject matter. Lectures on the methodology of the subject clarify the didactical concepts which form the basis of the curricula. In the seminars the attendees exchange experience gained in a certain area, they engage in creative discussions. The best experience in generalized, theoretically elaborated and becomes the basis for the jointly elaborated approach and creative work of all attendees.

Special attention in in-service education of science teachers is devoted to the practical aspects of experimentation. The attendees improve their skills in this field and are given the opportunity to organize even more efficiently experiment lessons and to involve pupils in problem solving. The level of practicals implemented at the Leipzig Institute is high. Experiences are disseminated very quickly and experiments are carried out

in specialized groups or courses at district level. The study course thus fulfils two functions: it upgrades the qualifications of course attendees and renders assistance to in-service teacher education activities at district level.

Within his paper H. Obst presented many concrete examples of in-service teacher education of chemistry teachers.

2.4.6 D. L a h i r y of India presented a paper On In-Service Education of Science Teachers: the Indian Context.

He pointed out that in a developing country such as India in-service teacher education is of great improtance. The problems, form and content of the work of science teachers is and will for a long time yet probably be very specific in dependence on the specificity of the social and enonomic reality, historical experience and expectations, educational capabilities and organizational limitations. "In our country," said D. Lahiry, "in in--service training it would be more necessary to impart training to teach science without an instrument than training the teacher for a new one."

In-service teacher education in India is relatively new and was only introduced at the end of the 1950's and was initially designed to increase the numbers of qualified teachers of which there was a considerable lack. There were many teachers without any professional training in the subject which they taught. The following strategies were therefore adopted:

1. to send the working teacher on deputation or study leave for the pre-service training course,
2. to take teachers through crash programmes of in-service training, short duration both in content and methodology,
3. extending the opportunity of correspondence courses /equivalent to preservice/ of university to the working teachers,
4. opening evening courses for part-time study,
5. correspondence cum contact courses for working teachers.

Simultaneously, constant efforts have been made, particularly in science and mathematics, for continued education or renewal

and refreshment of teacher preparation as demanded by the introduction of the new curricula and their goals, objectives, approach and content. The in-service science teachers' training, therefore, has taken various forms and structures in response to the diverse needs, capabilities, resources and experience of different states and school systems.

D. Lahiry then went on to give examples of programmes of in-service teacher education recommended by the central authorities and modified by the individual states according to local conditions.

a/ for elementary teachers:

1. Extension Service Centres were established in 1953 in different Teachers Training Colleges and States Institutes of /Science/ Education with added facilities of method guides, teaching aids, a small library and a vehicle. The purpose was to help the staff of the training institution to initiate plan and organize work for in-service training of teachers of the surrounding schools,
- to encourage the schools to improve themselves through the provision of consultative resources and small grants,
- to facilitate the vocationalization of pre-service training programmes by means of close association of schools and
- to initiate and coordinate field studies and research.

Extension services tapered out after 1966 in the absence of interest from the part of governments in many States.

2. The Science Education Programme was launched in 1964 as a cooperative venture of Unesco and the goverament of India and was designed for the reorganization and expansion of science teaching throughout the school stage.

Under this project new curricula were prepared, instructional materials including text-books and teacher's guides, were developed. Thousands of teachers throughout the country were given in-service training in content and methodology imparting the required skills and competencies in several phases.

3. Multimedia package programmes:

A series of programmes whose aim was to transmit knowledge of new curricula to a large number of teachers in the shortest period of time. The project was part of the Satellite Instruction Television Experiment /SITE/.

b/ Secondary and Post-Secondary Level

1. Summer Science Institutes. The Summer Science Institute Programme for the in-service training of teachers in physics, chemistry, biology and mathematics started from 1963. The orientation programmes were held for six weeks during the summer vacation to train teachers working at the secondary and higher secondary level. These courses were mainly devoted to impart the theoretical/practical aspects of science subjects, to upgrade the capabilities and to keep pace with the explosion of knowledge. In 1972 these courses were shortened to four weeks. With the introduction of the ten plus two pattern of School Education in 1974-1975 the summer courses were shortened to two weeks and were specifically designed for each class curriculum. All teachers using the curricula were trained in four years.

2. Continuing Centres of Education. The scheme envisages short-term courses of 30-40 hours for a group of about 30-40 in number at a time on a particular subject on a continuing basis. Initially 100 such centres were opened in 100 districts in different states. At present each centre caters for the need of schools in 3 - 4 neighbouring districts. On finding the result to be encouraging the number of centres will be increased to 500, one in each of the 500 districts of the country. The result so far is satisfactory.

3. All-India Science Education Project. This project has been undertaken jointly by the Government of India /NCERT/ and the British Council in 1980-81. Under the project about 20 science teachers of post secondary stage are sent each year to the Centres for Science Education, Chelsea College, London, for a period of nine months. On return they act as Resource Persons in the training workshops organized in their respective states. "In-service training is only a means and not an end in itself. We must review its scope and limitations to see how it can serve to achieve the goals for our future guidance," said D. Lahiry. From the mid-sixties science education in India got a new impetus, he went on to say. Efforts have been made to organize and coordinate governmental guidance and action both at the national and state levels in upgrading science education at all stages of school education. In spite of all achievements made in this respect the result has

not been up to expectations. College teachers still complain that students come from schools with insufficient grasp of science. Their general employability in decision making, scientific thinking and creativity have hardly improved.

It will be necessary to reorganize pre-service teacher training of science teachers as suggested by the National Council of Teacher Education /1978/. Only a few states have so far taken any initial steps to implement the recommendations for a content change. The rest remain as archaic as ever. Moreover, the in-service training of teachers has failed to make the desired impact because of insufficient interest of the part of the trainees. The success of the teacher is only measured by the number of successful students passing through memory based examinations. All efforts to change the archaic examination system has merely resulted in a change of external make up.

Very important is the involvement of teachers in curriculum development. Although some effort has been made to involve teachers in curriculum development the teacher has hardly any say in the centralized curriculum development decision making process. The professional organizations and teachers fora should be actively involved in the assessment of the need and organization of in-service courses. Professional isolation of teachers can also be minimized through discussion, seminar workshops organized by the professional organizations of teachers. The mass media could also play an important role in in-service teacher education.

2.4.7 R. T o b o n in his paper discussed <u>In-Service Training of Science Teachers in Colombia.</u>

Primary school teachers in Colombia are trained in special secondary schools and do not have a university degree. Secondary school teachers are educated in the universities for four years and usually combine two scientific fields, mathematics-physics, and chemistry-biology being the most widely used combinations. For majors in chemistry-biology some courses in earth sciences are included but there are no teachers trained in geology. Geo-

graphy is included in the training of teachers in the humanities. It is considered to be a social science and not a natural science.

In principle all secondary school teachers should have a university degree and the hiring of new teachers is generally done among recent graduates but there is a sizeable fraction of secondary school teachers who do not have a university degree and have been teaching for a number of years. During the last ten years several universities have developed special programmes that allow the secondary school teachers to obtain their degrees while they continue working in their schools. In these programmes several teaching methods have been used. They include courses run in different towns to make it easier for the teachers to attend and courses run as "distance education" or correspondence courses. Programmes that are aimed at the "professionalization" of active teachers should be considered as in-service training even though they are a substitute of the usual pre-service training.

In Colombia many universities and government institutes offer a variety of in-service training courses on many topics but it is difficult to discern long-term goals and objectives in the vast majority of these courses. In the short-term the courses obviously have the objective of allowing opportunities to get the certification needed for promotion of the teachers.

R. Tobon then summed up the results and experiences gained by Universidad del Valle where he is Professor of Physics. At this university a more comprehensive approach to in-service training of science teachers is being taken. Such training is just one of the trategies used in the overall effort to improve science teaching in the secondary schools of the Valley of Cauca, one of the provinces of Colombia.

This programme to improve the teaching of sciences includes the following activities:

1. Development of low cost equipment.
2. Preparation of textbooks and laboratory guides, both for pupils and teachers in physics and chemistry.
3. In-service training courses for teachers, closely related with the materials /equipment and guides/ developed.

4. Permanent contact and help to secondary school science teachers.

The permanent contact with secondary school teachers is kept by "Science Laboratories" as a meeting place. These laboratories have been organized in several towns near Cali and each one of them provides laboratory services to 10-12 secondary schools located at distances of no more than 20-30 km from these schools whose students go to the laboratories to perfom experiments.

Usually there are 40 or more students in a classroom and subgroups of 3 - 4 students work as a team in a laboratory. It is difficult for a single teacher to provide proper guidance and supervision to 40 or more students. The "Science Laboratory" has a small staff of teachers and assistants that help the school teacher to guide and supervise the experiments. There are weekly meetings attended by the staff of the laboratory, the teachers and advisers from the university. In subsequent years the meetings ivolve into discussion of content of the courses, methdological aspects and the development of experiments and written materials by the teachers themselves with decreasing advice and supervision by unversity faculty. This scheme has proven adequate and worthwhile for conditions existing in our part of Colombia, said R. Tobon, we are aware, he added, that it may not be adequate for other regions of our country and for other countries. The problems that the four activities listed above try to solve are the following, said R. Tobon:

1. Lack of enough equipment at every school for students to perform experiments in small groups.
2. Rationalization of the use of equipment and laboratories. A study made in 1978 indicated that these facilities were used for less than 6 hours a week in 80 % of the schools.
3. Lack of adequate training of secondary school teachers for laboratory work. The staff of the "Science Laboratories" rapidly gain experience in these types of work and act as multiplying agents passing their experience to the teachers.
4. Lack of enough time for teachers in the schools to plan, organize and run laboratory sessions.

R. Tobon stated that the strategies described were an attempt to

tackle some of the problems, actualy those that a group based in a regional university could do something about. But, he said, there remained many inadequacies of the Colombian educational system, such as low salaries, working conditions, etc., that were beyond the control of the universities and that have negative influence on the overall objective of improving the quality of the country's primary and secondary school education. R. Tobon in conclusion summed up some of the main lines of work for the next few years:

1. To maintain and expand the advising of "Science Laboratories" in the Cauca Valley. For 1984 two or more laboratories will be established in several towns in the region.
2. To continue the in-service training courses and to keep improving them. Such courses will continue to be offered in different locations to make it easier for teacher to participate.
3. To experiment with different schemes to use microcomputers as teaching aids, initially on a small scale and later on a large scale, equipping "Science Laboratories" with microcomputers and using them with relatively large groups of students.
4. To do research on "alternative schemes of thought" and to prepare materials - text-books, experiments, computer assisted instruction, etc. that try to overcome the problems encountered.
5. To try to reach teachers in far away and scarcely populated regions of Colombia with materials appropriate for distance education.

2.4.8 A. H. F e k i h of Tunisia represented two organizations, namely the Tunisian association "Young Science" and the organization "Union of Arab Scientific Clubs for Youth".

In his paper A. H. Fekih who himself is not a teacher explained the mission of these organizations in connection with extra-curricular scientific activities. The two organizations are involved in formal instruction. They are, however, striving to give ample space for extra-curricular scientific activity to

young people whose desires and inclinations to work in the field of science and technology are not satisfied by the conventional system based on prepared programmes. In this respect the speaker from Tunisia discussed the problem of the system of examinations where students who fail the examination tend to believe that they are there only as onlookers and that scientific activity is only for the gifted. In Tunisia the solution to this problem is being sought in the field of extracurricular scientific activity which has varied forms, the most frequent being scientific clubs and scientific vacation camps.

The scientific clubs were defined by the author of the paper as being totally independent of the school structure, this both geographically and administratively. This is done for psychological reasons because the young person feels greater freedom in the club than in the school. The second precondition of the good work of the club is technical equipment, instruments, raw materials, electronic parts and components, etc. In this area, namely as concerns more sophisticated and more demanding equipment the clubs cooperate with schools. The third precondition are the young people themselves; work in clubs involves young people from the age of 14 /third year of secondary school/ who come from diverse social backgrounds. Finally another important factor are club leaders. They are recruited from the ranks of teachers, professors, technicians, engineers. Here again the psychological approach of the leader to young people is very important. The leaders are club members and the young club members thus do not have the feeling of being in a school environment in the presence of a teacher who controls and supervises their work. The club leaders attend supplementary study courses, i.e., in-service teacher education.

3 WORKING GROUPS

The plenary session was followed by four working sessions which discussed in-service education of teachers of the following subjects: geography, geology, biology and chemistry. The discussion was related to suggestions for optimizing the in-service education of science teachers and dealt with the following problem areas:

- the determination of priority needs of teachers of science subjects and their satisfaction with in-service education,
- the proportionality of pre-service education and in-service education of teachers of the following subjects: chemistry, biology, geography and geology,
- the determination of the dominant component of in-service education of science teachers in a certain time interval of the teacher's pedagogical activity,
- the orientation of in-service teacher education in connection with changing social, economic, cultural and technical conditions,
- the integration of world opinion problems in the content of in-service education of science teachers,
- the intensification of the information user education of science teachers within their in-service education.

## 3.1 WORKING GROUP FOR IN-SERVICE EDUCATION OF GEOGRAPHY TEACHERS

3.1.1 The introductory paper was presented by Prof. RNDr. P. P l e s n í k , DrSc., Chairman of the Working Group <u>In-service education of geography teachers</u>

1. General principles and measures - common with teachers of other subjects:

- In the first years of service attention should be focused on acquiring and improving pedagogical mastery. Each graduate must be guided and this guidance must be planned, centrally controlled and conducted in close cooperation with methodologists of the respective institution of higher education and the school principal. It should be completed with a validation, related to the teacher´s promotion.
- To maintain a continuous innovation process which concerns not only the subject matter but also the instruction method. The results should be verified and related to promotion at time intervals of 10 years. Innovation should take place in close contact with institutions of higher education. A significant role in this respect should be played by specialist journals and magazines which should run a column related to geography in the school.
- To deepen the teacher´s interest in problems related to the subject and to appreciate good results /awards, rewards, etc./. This, for instance, concerns leaders of hobby groups, directors of olympiads, excursion guides, etc. To involve at least part of the teaching population in the effort to penetrate more deeply into the specialist problem area of the subject, to focus on a more narrow range of problems such in which the teacher could, in cooperation with the respective institution of higher education achieve his own original results. It is necessary to establish such a system of work in the school to provide the teacher with ample space for self-realization within the pedagogical process

which will in turn lead to healthy differentiation and will help raise standards; it will be necessary to do away with all work which burdens the teacher, reduces space for the said purposes and leads to a levelling of standards.

2. Special principles and measures with regard to the specific characteristics of geography.

Geography deals with the landscape in complex perspective, both at general and at regional level. The landscape is a singularly complex system in time and space, consisting of landscape components interlinked with a wide range of factors and components. The result of this interlinkage is the specific character of any landscape. The geographer puts emphasis on the study of the interrelations of landscape components, the natural landscape and human society. The synthesis of knowledge of the landscape has always been and will remain the domaine of geography. The continuous growth of the world population and especially the rise in their living standards and consumption demands, the exploitation of natural resources as well as scientific and technical development will result in man´s increased dependence on the landscape, its rational utilization. Already today a considerable part of the world population is in a situation which forces it to assess the landscape more rationally and in a more complex manner with regard to its optimal utilization, including the exact identification of its potential, with regard to environmental control and the creation of the environment. The innovation of post-graduate teacher education must take all above mentioned aspects into consideration. We suggest that it should be oriented to two problem areas:

a/ Emphasis should be placed on clarifying the relations between landscape components, man´s activity in the landscape, synthesis in the landscape, the rational use of the landscape including environmental education and education for nature conservation. The landscape should be underlined as being national property to be economically managed with regard to the prospects of future generations, man´s activity should be controlled in such a manner as to secure the consistent and permanent regeneration of the main resources of the geosphere /air, water, soil, plants, animals/. The knowledge should be inculcated in pupils that the landscape is a continuously developing open system in which any change in

one component will cause a chain reaction of processes resulting in a new quality, a changed landscape. Therefore any interference in the landscape must be well conceived with regard to the prognosis of its further development. The analysis and synthesis of the landscape will help us identify future impacts of man´s planned interference, e.g., drainage of swamps, deforestation, the construction of hydro projects, industries, etc. The clarification of inter-relations in the landscape, the logical thinking of pupils on these relations significantly strengthens the formative traits of the pupils´ personality and supresses the informative aspects of instruction based on memorizing, such as was practiced until recently and which lead to the stagnation of the intellect.

Theoretical knowledge of landscape components and their interrelations, as well as of man´s activity in the landscape should practically be verified by pupils in field practicals. It will be indispensable to introduce into geography instruction practicals in form of field work and excursions. This is a highly demanding task for teachers. In order to be able to cope with it the teachers will have to make an in-depth study of the landscape which they are using for field work and practicals, namely in the environs of the school and they must moreover be able to proceed methodologicelly in such a manner as to allow the pupils to comprehend landscape phenomena. Special attention should be devoted to negative phenomena in the landscape, their elimination, as well as to the complex concept that the respective landscape should be organized with regard to its optimal use. In case of necessity it will be necessary to provide for the teacher specialist consultations with the respective specialist from an institution of higher education or other relevant institution in the area. A senior experienced teacher should help in methodological instruction. The young teacher should elaborate a regional study about the selected training area. The young teacher should defend the study within the validation procedure, at the latest within 10 years, possibly sooner; this will depend on the aptitude of the graduate, i.e., without a minimum time limit being set. Validation is an interview in which the graduate should prove especially

his/her pedagogical maturity as well as the knowledge of innovatory information related to the latest development in geography. b/ Geography instruction is to provide the pupil with a survey of information on the Earth as an entity, its structures, various types of landscapes, countries /states/, a more detailed knowledge of the pupils' own country in order to be able correctly to understand phenomena and events at home and abroad. Geography contributes very significantly towards strengthening the idea of statehood, in the socialist countries to the education for socialist patriotism and internationalism. In view of the speed of the development of events at home and abroad and basic changes which are taking place in existing conditions an effective system of information transfer /and the control of the acquisition of information/ will have to be found such as to enable the geography teacher to be able to operatively and continuously innovate the subject matter. The teacher must not rely merely on the daily press. The main part in this process should be taken by centres for the organization of post-graduate education of teachers which should continuously provide information on territorial changes in the world and should also evaluate these changes in order to allow the teacher to quickly find the correct orientation. Geographical periodicals published several times a year should carry a regular column for geography teachers, mainly devoted to the problems of innovation.

The principal of the respective secondary school and the centre for the organization of in-service teacher education should play the main role in providing pedagogical knowledge and experiences. The graduate should receive guidance from a senior educator. The organization centre should organize broader methodological and innovation activities, usually in cooperation with the institution of higher education, such as, for instance, model lessons, model field practicals, work with the map in field conditions, etc. In-service education of geography teachers should include compulsory excursions both within the Czechoslovak Socialist Republic and to foreign countries. It will be necessary to do away with the lay view that practical recognition, the study of various types of landscapes, the verfication of theoretical knowledge of various countries is a holiday trip for geography teachers and to

emphasise that it is a very important method for increasing the specialist and pedagogical maturity of the teacher. There is a substantial difference between the presentation of the subject matter on the basis of mere theoretical knowledge and on the basis of authentic knowledge. Every geography teacher should learn to know his homeland and at least the European socialist states. Authentic knowledge not only improves the teacher's ability to cope with instruction but also raises his prestige in the eyes of the pupils.

The geography teacher should always, even after a longer lapse of time, maintain contacts with his alma mater. Our faculty meetings of teachers and graduates linked with specialist seminars, discussions and social events have proven to be very useful. Such meetings are useful for both parties because they provide feedback for the university teachers.

Education for world peace is an indispensable part of content of the work of the teacher, especially the geography teacher. The basic mission of every individual Homo sapiens, i.e., human being, is to contribute by concrete work and through the resulting values to the development of regional social systems, and thereby to the development of all humanking. It is the fundamental as well as supreme goal which every man and woman should strive to fulfil according to his or her abilities and possibilities. This is a biological law which is encoded in each individual, every plant and animal species, thus also in Homo sapiens. The overwhelming majority of individuals of the respective species endeavours to maintain the positions and to develop the species as a whole, weaker individuals even though they lose in competition with their stronger rivals contribute to the fulfilment of this basic target. Nature in view of its inexhaustible variety has the ability to create new and irepeatable objects of its inventory, it also bears individuals with extreme properties who do not fully integrate in the said mechanism. Under the given conditions such individuals are excluded. Also in the human society there exist extreme asocial elements which are eliminated by the healthy society. The geography teacher should correctly understand and explain to his pupils the structures on Earth, their social systems, their external inter-relations and internal structural relationships. He must

proceed from the principle that values produced by the work of man are a contribution to the development of humankind. Parasitism in any social system is an obstacle to the development of society. Social systems which allow the exploitation of man by man are a hindrance to the development of mankind, this namely concerns such systems as colonialism and neocolonialism, especially imperialism as the supreme form of the exploitation of entire regional structures. Any destruction of the values produced by work /with the exception of their replacement with new and more advanced and thus also more efficient products/ is an amoral act which empoverishes all humankind. Thus, for instance the destruction of food supplies in years of rich harvests with the aim of preventing price cuts is done to the detriment of all humankind and should be eliminated as an amoral act, namely at a time when millions of people are dying of starvation. The allegation that what I have produced belongs to me alone and I can therefore do what I want with it will not hold. Unemployment also empoverishes all humankind by robbing it of enourmous values which millions of working people could contribute to the development of humankind. Every war destroying values produced by work and especially the producers themselves is an an ultimate evil. To deteriorate the international situation and to drive humankind into a nuclear holocaust is a perversive crime which may destroy civilization on this planet. The unprecedented development of science and technology and the obvious increase in living standards in recent years may be attributed to the almost 40 years period of a world without a world war. The geography teacher has ample space for using factual argumentation to guide pupils to the correct understanding and objective assessment of social phenomena and processes from the point of view of the supreme goals of humankind, to guide pupils to the profound conviction that peace is the basic condition for the self-realization of every human being to the benefit of the development of all humankind.

3.1.2 Selection of communications presented in the discussion

The ideas presented in the introductory paper were further developed in the discussion by other participants in the session of the working group dealing with in-service education of geography teachers. Doc. RNDr. F. Z a t k a l í k , CSc. dealt with the problems of excursions in in-service education of geography teachers. With regard to the emphasis which is of late being put in geography on the formative aspects of personality development and the suppression of the informative aspects of instruction it will be necessary to verify theoretical knowledge by practical field activities. Direct geographical observation of the landscape is an effective instruction method because it leads to the understanding of the relationship between abstract cognition and actual facts. Higher education devotes appropriate attention to excursions. Under the given conditions geography excursions only allow the partial recognition of certain types of geographic landscapes and it will therefore be necessary to devote attention to excursions also in the in-service education of teachers. The author recommended that excursions should be divided into three stages, namely: 1. learning the method of direct observation of the landscape and the guidance of geography excursions, 2. deepening and learning of new specialist knowledge and the related specialist problem areas, 3. cognizing countries which have different physicogeographic or socio-economic structures.

Prof. RNDr. J. T u r k o t a , DrSc. in his communication dealt with the role of the excursion at basic /primary/ and secondary school with regard to pedagogy and methodology. He outlined the problems of young teachers who are not appropriately prepared in this respect. Insofar as the geographical excursion is to fulfil its role it is the teacher who must primarily be prepared for it: he must become acquainted with the natural environment in which the excursion is to take place, he must draw up the methodological procedure with regard to subject matter and the age of the pupils and in the lesson he must prepare his pupils for the excursion itself.

The teacher teaches the pupils to understand the inter-relations between observed phenomena, to form in them the conviction of the dialectical and materialistic character of studied

phenomena and objects.

The teacher must be aware that the content aspect of geographical education proceeds from the structure of current changes in geography - the transformation of geography from a descriptive science to a constructive science, dealing with the human environment, the transition from the study of nature to the study of the inter-relations between the nature and the human society, etc.; this must lead to a change in the existing encyclopedic instruction if geography, to the comprehension of existing relations in the landscape and to logical geographical thinking.

Doc. RNDr. J. M l á d e k , CSc. focused his attention on the necessity of the permanent education of teacher with regard to socioeconomic geography. Of late socioeconomic geography has been oriented to the study of territorial socioeconomic systems, i.e., to the identification of territorial systems and their interlinkages, the recognition of their structure, hierarchy and factors of development. He emphasised the need of adequate training and systematic education of teachers in connection with the dynamic transformations of these socioeconomic systems which requires new and better methods and study technologies /the application of exact methods, namely statistical, mathematical, cartographic and other models, the application of systems theory and the theory of information, the importance of geographical forecasting, the establishment of data bases using computer and transfer technologies - information sources from aircraft and satellite photographs, etc./

It is necessary to form in teachers a dynamic, dialectical way of thinking and the need to constantly innovate their knowledge and to critically and creatively evaluate the studied problem area. It is also necessary to create conditions such as will allow the new knowledge to reach the teacher as quickly as possible. This role may be fulfilled by a supplement of a specialist periodical oriented to updating the basic factological information contained in text-books.

3.1.3 Conclusions and recommendations

The Geography Working Group recommended that the in-service education of geography teachers be implemented in the following stages:

Stage 1: induction and supplementary which is to introduce the graduate into teaching practice in his first year of service, in the following four years to supplement and deepen his theoretical and methodological knowledge and its practical implementation. This stage should be terminated with an interview /first validation/. Responsible for the organization and implementation of this stage is the school authority.

Stage 2: innovatory which should be implemented after the first 10 - 15 years of service. The aim of this stage is the thorough innovation of the teacher's specialized and didactical knowledge to upgrade it to the level of the latest knowledge of geography and didactics of geographical disciplines, the updating of practical skills, required for the application of modern graphical and didactical research methods. This stage should be implemented in form of post-graduate study courses realized at institutions of higher education and should be completed with a defence of the final thesis before a commission consisting of faculty staff and representatives of the school authority /second validation/. The organizer of this second stage of in-service education of geography teachers is the school authority, the study course is run by an institution of higher education which trains teachers for schools of the first and second levels.

Stage 3: the permanent education of teachers throughout his serving life. This stage is implemented in form of independent study materials /texts, methodology-related literature, etc./ and in form of regular lectures, short-term seminars, block courses and excursions designed for updating the knowledge and practical skills of the teachers, in cooperation with institutions of higher education. The school authority will be responsible for the organization and implementation of this stage of in-service teacher education.

In our time geography has undergone a fundamental transformation. Descriptive geography based on memorizing, has been replaced by modern dynamic geography which puts emphasis on the

study of relations between the natural environment and man's activity.

Geographic phenomena and processes with which the pupil is theoretically acquainted in geography lessons must also be explained to him by the teacher in the field practicals and excursions which for the teacher is a highly demanding task.

We therefore suggest that the space for excursions and field practicals in geography instruction be broadened and that within in-service education teachers be prepared for the given tasks, both as concerns the specialist content of such lessons and as concerns methodology. Within in-service training every teacher should go on and excursion abroad as part of the upgrading scheme.

Geography as a science related to the landscape, i.e., its natural elements and human activities, has the best pre-requisites for the fulfilment of the following tasks within the framework of the in-service education of teachers:

1. education for a scientific world opinion, patriotism, international understanding, the struggle for the permanent maintenance of world peace, the development of society, the use of all possibilities for education for a correct attitude to values produced by society, education for nature conservation and environmental education as the main goal of instruction in our schools. The analytical and especially the integration applications of geography should be used with regard to the creation and protection of the environment and the use of natural resources for the development of the economy.
2. to use to a considerably greater extent the in-service education of teachers to provide teachers with the knowledge and skills allowing them to fully use excursions and practicals in geography instruction. Education and training of methodological and specialist skills allowing the teacher to cope with excursions and field practicals should take place in all three mentioned stages of in-service education of geography teachers.

Organisation of in-service education of geography teachers:

1. permanent working groups should be set up consisting of representatives of institutions of higher education, scientific and research institutions and serving teachers which would consistently deal with the problems of in-service teacher education,

mainly as concerns content, methods and materials;

2. the use of the services provided by national and international information systems for the in-service education of geography teachers should be publicized;

3. a working group should be set up to be responsible for a central inventory of educational media and teaching aids related to geography, their use and systematic innovation;

4. we recommend that all member countries should incorporate general chapters of environmental subject matter in all science subjects. In this respect valid curricula and syllabi should be revised and innovated.

## 3.2 WORKING GROUP FOR IN-SERVICE EDUCATION OF GEOLOGY TEACHERS

3.2.1 Introductory paper presented by Doc. RNDr. A. S c h a - l e k o v á , CSc., Chairperson of the Working Group.

We are witnessing the rapid development of science and technology in the whole world, namely in the industrially advanced countries. Scientific and technical progress is placing increasing demands on the general educational standards of the population and higher qualifications in all fields of human activity. The pre-requisite of further technical and scientific development, progress in thinking and the rate of development of living standards is the continuous rise of the level of the educational process. These facts are the prime mover of all educational reforms which are being made on a world scale. They lead to the deepening of the basic educational system, to the development of training and education and of formal and non-formal educational activities aimed at providing the general population with the knowledge and skills for the effective use of the latest knowledge of science and technology.

Even contemporary modern pedagogy attributes the decisive role in the educational process to the teacher. In the period of revolutionary changes in science and technology ever increasing demands are being placed on the teacher, namely as concerns the broadening, deepening and improvement of his/her own educational level, the development of his/her personality, the ability to manage the educational process and to purposefully use all factors of education.

These exacting demands cannot be met by pre-service education and training provided to student teachers. In the period of the scientific and technical revolution education must be a lifelong process.

In this paper we shall be dealing with the problems of the

in-service education of geology teachers.

We first of all consider it to be necessary to mention the aspects of geology instruction at grammar schools in the Czechoslovak Socialist Republic and in this connection to discuss some specific problems of the geology teacher and his in-service education.

Geology as a subject taught at secondary general education schools /grammar schools/ is conceived as a partial integration of geological sciences, as a uniform subject with an inner structure, a subject which proceeds from the principles of the development of inorganic nature. The thus conceived subject should be an intermediate link towards the complete integration of the subject Earth science. The integrated concept of geology instruction is firmly incorporated in the curricula of the educational systems of many states.

The new gradual content and organizational reconstruction of the educational system in the Czechoslovak Socialist Republic does not envisage geology as being an independent subject in grammar school education. It is to be an optional subject, possibly an elective subject. The only exception are to be four selected grammar schools with extended geology study courses. Regardless of the world trend towards integration the geology subject matter is to be split up and integrated in biology, chemistry and geography. Such trends in the history of instruction have proven erroneous. The splitting up of the geology subject matter and its distribution into other subjects deprives the pupil of the possibility of acquiring a comprehensive view of inorganic nature which is studied by the science of geology. Inorganic nature is the basis of all processes and events in nature and of life on Earth, it is part the material basis of society. Together with organic nature which is studied by the science of biology it forms one complex entity.

The exclusion of the integrated subject of geology from the curricula deprives the students of the possibility of acquiring a comprehensive understanding of the unity of organic and inorganic nature, their interrelations, the material substance of the world, thus being deprived of the valuable educational contribution of this subject.

Apart from the above mentioned aspects the said measures will bear quite a wide range of other problems, such as the work of qualified teachers, the loss of the personality of the geology teacher whose further education becomes problematic. The dissipation of the science of geology into other subjects will require the supplementary education of biology and chemistry teachers etc., who have not been prepared to cope with the additional geology related subject matter.

The outlined problems which are specifically Czechoslovak will certainly be correctly resolved in the future.

Notwithstanding, we shall now devote our attention to the in-service education of geology teachers because this seminar is to deal with the in-service education of science teachers in the international context.

The identification of aims and the determination of the didactical concept of in-service education of geology teachers should proceed from the demands placed on the personality and educational level of the geology teacher - this both in general and specific terms. These demands are as follows:

- the geology teacher must first of all have a clear idea of the importance of geology for practice, the place of geology in modern society, he must know why he is teaching the subject, he must have a knowledge of the impact of the geology instruction on the educational sphere of the teaching process;
- the geology teacher must have adequate knowledge of the science of geology in order to be able to develop pedagogical creativity in his subject, in order not to become "a slave of the curriculum and of text-books". He must be able in his subject to develop the integration aspects which are reflected in the selection and structure of the subject matter, in order to underpin the dynamic unity of processes in inorganic nature. As for methodology he must guide his pupils not only to acquire ready-made knowledge but he must deepen their logical thinking;
- the geology teacher should have comprehensive and adequate knowledge of other science disciplines and mathematics in order to be able to strengthen inter-disciplinary relations;
- the geology teacher must have a good knowledge of subject teaching, i.e., the didactics of geology, which places demands

on the teacher as specialist and educator;
- a good knowledge of the science of education and psychology will allow the geology teacher to manage the educational process with maximal educational efficiency and will help to suitably motivate geology instruction while raising the effectiveness of instruction and educational work;
- a knowledge of philosophy will have effect on the allround development of both the teacher and the pupil;
- for the implementation of all educational goals the teacher should be able to choose suitable instruction methods, forms and means. The use of educational technology will intensify and increase the final effect of the educational process.

The aim of the in-service education of geology teachers is usually defined in abstract terms: to deepen, update and broaden the knowledge and experience acquired by pre-service education in accordance with the needs of society and scientific and technical development. These abstractly defined goals reflect general requirements which must be given concrete form and content.

The following partial goals may be set for all science subjects:
- the upgrading of personal qualification,
- becoming acquainted with novel relations between scientific disciplines,
- improving the teacher´s ability to guide experimental work, practicals, excursions,
- to provide new information in the given field,
- to prepare the teacher for creative activity, for independent work, possibly for educational research work,
- to facilitate preparation for instruction,
- to mediate scientific knowledge for instruction,
- to improve the cooperation between the school - higher education and practice,
- miscellaneous.

As concerns specialist in-service education of geology teachers we recommend that attention should be oriented to meeting the following requirements:
- Updating and broadening subject knowledge

The rapid development of new scientific knowledge related to

the development and use of new technology. The development of the science of geology and interdisciplinary sciences /geochemistry, geophysics, cosmogeology, etc./. The development of applied geology proceeding from the practical demands of industry, agriculture, etc. /geology of deposits, hydrogeology, engineering geology, soil science/. Becoming acquainted with the most important current knowledge of the respective science disciplines and their impacts on practice /global tectonics, the results of cosmic research applied to the geology of the Earth, etc./

- Deepening and refreshing the knowledge of the geology teacher
To proceed from the modern concept of recognizing the relations and complexity of geological processes. To put emphasis on the aspect of integration, to depart from the existing arrangement of the subject matter into independent units according to the system of the science of geology. To underpin the inter-relations of individual geology subjects and inter-disciplinary relations. To underline inter-subject relations /biology, geography, physics, chemistry, mathematics, etc./
- Underpinning the regional aspects of study
Great attention and emphasis should be put on recognizing the geological structure of the school environs and the area surrounding the school in which the teacher works; the regional geological and geomorphological conditions of any certain region /regional geology/ are the result of the long-term development of the region /historic and stratigraphical geology/. The long-term development of the region may be ascertained by the analysis of rocks and fossils /biostratigraphy, lithostratigraphy/. The development of fossils reflects the conditions of life in a certain environment /relations betwen living and non-living nature, ecology/. The basic construction materials of a certain area are minerals and rocks /mineralogy, petrography/. Their occurrence and deposition on the surface of the Earth is not accidental but observes certain laws /geochemistry, geology of deposits/. The possibilities of using such rocks occurring in the school environs /mineral raw materials/. One of the most important raw materials is water /hydrogeology/. The geological conditions of the school environs change, they are

affected by extraneous geological factors, among whom of late man is the most important /the creation and protection of the environment/.

- The development of all forms and methods of education and instruction

  The new arrangement of the content of education and instruction requires the development of all forms and methods. Observation is an important method in geology and the excursion is the most progressive form.

In the Czechoslovak educational system we have a unified system of in-service education of teachers and other educational personnel. It is part of planned life-long adult education.

The content of in-service teacher education is unified and contains the ideological and political, pedagogical and psychological and subject specialization components.

The structure of the system of in-service education consists of three stages, the first and second stages are compulsory. The three stages include:

Stage 1: Induction. Induction is realized in the first year of service and its main function is to adapt the beginning teacher to the new environment. It is oriented mainly to the methodological /subject teaching/ component of the instruction process.

Stage 2: Post-graduate education of teachers whose main function is innovatory. It takes two years and is implemented in part-time study courses 6 - 8 years after graduation. It is completed with a final written thesis and oral examinations before a commission.

Current practice has shown that post-graduate education of teachers has its shortcomings in content and organization. The main shortcomings are the excessive work load involved /consultations, lectures and block courses are organized in the teachers' free time/. The completion of the study course does not have any practical influence on the teacher's promotion and is thus no adequate stimulus. Gaining the scientific degree od Doctor of Natural Sciences /RNDr./ has become the equivalent alternative to post-graduate study and teachers have been giving it preference. Under the new law on higher education no written thesis is required for gaining the said title, graduates only sit for oral examinations before a rigorous commission. The social stimulus of

this alternative is more effective.

Stage 3: Functional study. This type of study is compulsory for teachers who want to hold or already do hold certain selected posts in the educational process /methodologists for the management of the educational process, inspectors, school-counsellors etc./.

We have the following recommendations and comments as concerns the implementation of in-service education:

For Stage 2: - controlled innovatory /post-graduate/ education should be revised following an in-depth analysis which will be available after the completion of the branch research project related to this subject;

- to consider the possibility of shorter study courses;
- to suitably stimulate attendance at study courses of the second stage of in-service education by promotion and salary incentives;
- to introduce compulsory excursions for geology teachers in this stage of in-service education. In the system of in-service education to introduce selective elective themes next to the compulsory forms of education.

Elective in-service study should be implemented in form of controlled organized study and should consider:

a/ the needs of society /topical themes related to the reconstruction of instruction, the school organization, ideological and political schooling/,

b/ the needs of teachers in response to their suggestions and requirements.

In-service teacher education is basically founded on independent study. For this reason it will be necessary to broaden the information sources by suitable literature for all study stages.

Controlled organized forms of study may orient in-service education in accordance with the needs of social practice and the development of scientific and technical progress.

In-service teacher education is conceived as an open system

which makes possible its continuous improvement. The development of this education may be influenced by an in-depth analysis of the current stage and its conclusions may be used for upgrading the pedagogical work of secondary schools teachers.

3.2.2 Selection of communications presented in the discussion

Prof. RNDr. M. M i š í k , DrSc. in his communication discussed the needs of geology teachers according to what they themselves believe they need for their work, what shortcomings they feel, what should be the content of post-graduate education.

Geology instruction cannot do without field work and without demonstrations of concrete materials - rocks, fossils, minerals. In this respect the teachers would be helped by methodological /subject teaching/ work sheets developed by professional geologists for the environs of each school. Such work sheets should contain the accurate location and description of suitable localities, instructions for teachers how and where to obtain rocks and minerals needed for instruction, etc. Geology material could be supplied by geological institutions and by institutions of higher education who could hand over to the schools material from earlier research projects.

As concerns post-graduate education, experience has shown that, for instance, one three day block course is more effective than three one day block courses. These block courses should not only contain lectures but should also concentrate on innovations in geology, should put emphasis on the exchange of experience, on experience gained by teachers with activity, methods, varied and interesting lessons, making geology lessons less monotonous and more interesting. The teachers should impress on the pupils' emotions. It depends on the teacher to what extent he will be capable of animating the world of so-called inanimate or non-living nature. The author gave examples of some themes of discussions which could be organized to involve pupils and students, e.g., natural disasters caused by geological factors. Seemingly minor means may be used to attract the interest of pupils, e. g., the

aesthetic influence of attractive collections of materials, such as decorative stones, etc. The author stressed that it should be borne in mind that only a negligible proportion of students will enroll in geology study courses at institutions of higher education. "We are therefore not orienting geology instruction at secondary schools to a preprofessional education of geologists but to the formation of an educated and culturally mature person. Post-graduate education should primarily arouse in the attendees the conviction that geology can be successfully taught as an interesting subject and they should be provided with the means to do this," concluded the author of the communication.

M. R u m a n o v á , grammar school geology teacher presented her experience with the in-service education of geology teachers, the position of geology in the new concept of the educational system of the Czechoslovak Socialist Republic and with some suggestions for the implementation of in-service education of geology teachers.

As concerns experience gained in this respect so far in-service education of geology teachers will focus on the self-instruction of teachers, independent study. The author pointed out that even though the economic factor is not the stimulus for in-service teacher education, teachers are not satisfied to make do with their university knowledge and continuously upgrade their education using all available forms and means which is, of course, highly demanding on their free time. The motivation factors are their own professional satisfaction and especially their love for their teaching profession and their subject, as well as the effort to transmit advanced and practically usable knowledge and thereby to prepare the young generation for meeting the needs of the socialist society.

In the new concept of the Czechoslovak educational system the status of geology teachers and thereby also their in-service education will differ from that of teachers of other subjects /of paper presented by chairperson of the working group A. Schalekvá/. The planning and implementation of in-service education of geology teachers must proceed from the needs of our socialist society, we must approach the in-service education of teachers according to the working assignment of the respective teacher,

namely:

- teachers whose specialization does not include geology and who will teach certain geology units in their respective subjects /chemistry, biology, geography/,
- teachers whose specialization does include geology and who teach at basic /primary/ schools,
- teachers whose specialization does include geology and who teach at secondary schools /either grammar schools or vocational schools/.

In conclusion the author presented certain recommendations for the in-service education of geology teachers. The in-service education of geology teachers, she suggested, should be divided into three cycles:

1. to orient attention to the education of beginning teachers, namely with regard to methodology and pedagogy,
2. specialization in-service education according to the working assignment of the teacher in the working process and according to the type of school at which he teaches,
3. to orient attention to new results of science, research and technology such as are applicable in the teacher´s practice.

Each cycle should be approached specifically, emphasis should be put on the practical aspects of the studied problem area. Great attention should be devoted to the development of accurate and specific methodology. It would be desirable if in-service education forms were adjusted in such a manner as to make in-service education become part of the working load of the teacher allowing him to devote his free time exclusively to independent education.

3.2.3 Conclusions and recommendations

In-service education of geology teachers has its specific problems which follow from:

a/ the obscure concept of geology as a subject and its significance in the general educational process

b/ the changing status of geology in the curricula of secondary school education

c/ changes in pre-graduate teacher education.

We consider it to be necessary to mention at least the following aspects:

Geology as a subject in secondary education is conceived as a partly integrated subject of geology disciplines. As a unified, internally organized subject which proceeds from the principle of the development of inorganic nature. This partial integration should be followed by complete integration into the subject Earth science. Importance of geology instruction for the profile of the secondary school graduate:

a/ geology provides the student with fundamental knowledge of inorganic nature, its development, has the character of a general education /basic/ subject;

b/ together with biology pupils acquire basic knowledge on all nature, are taught to understand the unity of inorganic and organic nature, their inter-action. Geology is also important for forming the world opinion, for the creation and protection of the environment; its importance for the national economy is increasing;

c/ geology forms the necessary foundation for the study of further scientific disciplines taught at science and technical institutions of higher education.

Status of geology in secondary curriculum

In our countries we used to teach not only biology but also geology. It has become evident that the distribution of different parts of geology into other subjects /biology, chemistry/ has its shortcomings, namely the loss of the structural linkage of geology disciplines. Despite these negative experiences this error is now again being repeated which we consider to be ill-conceived and harmful.

We recall that in some countries, e.g., in the USSR, geology disciplines are taught in the subject physical geography. In the curriculum the number of lessons allocated to the geology subject matter in that country is double the number of hours allocated to geology in the independent subject geology which used to be part of the secondary school curriculum in this country. Some countries have decided to fully integrate geology disciplines in the subject Earth science for which many excellent text-books have been written.

Current state of geology instruction at secondary schools

The new concept of our educational system does not incorporate geology as an independent subject as of the school-year 1984-1985. It will be split up into small units and distributed into chemistry, geography and biology. The incorporation of geology as an elective subject, possibly as an optional subject in the secondary school curriculum will not only weaken the subject but the final consequence of this measure will be the exemption of geology from secondary school instruction as such. In the Czech Socialist Republic the only exception will be four specialized grammar schools with extended geology instruction and geology oriented secondary schools, such as geology vocational schools. In the present stage of the reconstruction of the educational system it would be desirable if extended geology instruction were introduced at at least three grammar schools in the Slovak Socialist Republic in order to allow for follow-up study of the subject at institutions of higher education. The graduates of these grammar schools would thus also be prepared for work as middle technical personnel in geology related fields.

Pre-graduate study

At present teachers with the geology specialization are not being trained at any institution of higher education.

Education in this respect should be ahead of present development to be able to meet the demands which will be placed on it by the future structure of society. We therefore assume that instruction in geology disciplines will regain its justified position in secondary science education.

This will, in turn require higher education level teacher training in this discipline. We consider it to be optimal to consider the introduction of a combined teaching specialization in two subjects: Earth science is combination with physics, possibly with the foundations of production. In case of the incomplete integration of geology science the possibility should be considered of introducing a combination of three subjects in the specialization Geology - Geography - Biology.

In-service education of teachers

The range of the problem area of the in-service education of science teachers, including geology teachers will require an in-depth analysis of this process, At this point we would like to briefly mention certain problems and to suggest certain measures:

The aims of in-service education should be specified in relation to the subject and the real needs of teachers and society should be well conceived and defined on the basis of a detailed analysis. An important factor in this respect will be the correct motivation of teachers. This may be inner motivation because in his work the teacher is continuously confronted with the level of his knowledge and his pedagogical and psychological skills. He He usually eliminates shortcomings in this respect by independent study. External motivation comprises the system of social appreciation, the suggested system of validation, promotion.

The content of in-service education is unified and contains ideological and political, pedagogical and psychological and subject education.

Content and subject education. In geology we recommend that regional aspect should be emphasised, that attention should be focused on the protection and creation of the environment, on new trends in the development of the science and its importance for practice.

Forms of in-service education. Independent study will also in the future be decisive for upgrading the teachers' qualification. It will therefore be necessary to grant considerable time allocations for such education. Independent forms of education will also include wider fields which influence the personnal development of the teacher, such as broader political, philosophical, cultural education, etc.

The structure of in-service education is defined in three stages. The greatest number of comments concerned post-graduate study. We select the most important.

Post-graduate education follows up on teacher education which is a combined study course in two subjects. In-service combined education does not meet its purpose unless the teacher teaches both subjects of his specialization. Thus, for instance, if the teacher does not teach geology which is subject of his specialization.

The question of supplementary study in case the teacher has for a long time been teaching a subject for which he is not qualified.

For teachers who in the future are to teach geology in their

subject and have not studied the subject matter within their pre-graduate education it will be necessary to introduce supplementary geology study courses to allow them to comprehend the broader relations of the incorporated parts of geology in the system of geology disciplines.

In the organization of post-graduate study courses priority should be given to short-term courses instead of frequent several days consultations which are a great time loss.

Within post-graduate study block courses in natural surroundings should be organized which will allow to linkage practical field instruction with theoretical lectures. Block courses and short-term study courses afford the opportunity for a better exchange of experiences among the teachers.

In post-graduate study courses excursions should be considered as being the most advanced form of education and of the methodological preparation of leading geology hobby and interest groups.

Post-graduate study courses are to show to teachers better and more interesting ways of presenting the subject matter, e.g., how to bear emotional influence on pupils by establishing contacts with them using the aesthetic motives in the respective subject matter.

Gaining the title RNDr /Doctor of Natural Sciences/ is the equivalent alternative to post-graduate study. Since the promulgation of the new law on higher education which does not require graduates to present a written thesis but only to sit for rigorous examinations teachers have been giving priority to this alternative because the social stimulus is more effective. The problem will have to be resolved.

Within post-graduate education teachers should become acquainted with the foundations of pedagogical research. Participation in educational research is considered to be a significant component of teacher in-service education.

Information sources should be provided to all levels of in-service education.

The requirement has been voiced by geologists that methodological work sheets be elaborated for the surroundings of each town in which there is a school. These methodological sheets will

become a significant aid for geology instruction.

In-service education will be enhanced by cooperation with the mass media, e.g., television, through VTR, etc.

It is desirable that various institutions which provide in-service teacher education should have central centres, e.g., in ministeries, central educational institutes. The plan of actions should be drawn up one year ahead of schedule which will allow for better coordination and will preclude duplicity.

In general the unified system of in-service education of teachers in the Czechoslovak Socialist Republic is on a high level even in the international context - which has been demonstrated at this seminar. It is an open system and may thus be continuously amended in order to upgrade the process of education and instruction.

## 3.3 WORKING GROUP FOR IN-SERVICE EDUCATION OF BIOLOGY TEACHERS

3.3.1 Introductory paper was presented by Doc. RNDr. V. S e k e r k a , CSc., Chairman of the working group.

System of in-service education of biology teachers

In the present conditions of the scientific and technical revolution, with the growing role played by the natural sciences in the development of production, biology is undergoing a tumultuous revolutionary process which is conditioned on the one hand by progress in the experimental study of the molecular foundations of life and on the other by new theoretical conclusions. This is thanks to the fact that biology is using such general methodological principles as is the systems approach and the theory of information by which it is possible to explain even highly complex linkages at micro- and macrolevels of the organization of living systems.

Today biology stands at the junction of many sciences, mainly physics, chemistry and mathematics. It has become the "focus" of the experimental interest of various scientific disciplines. Complex processes are taking place in the differentiation and integration of biology, new methods are being developed, new technical means of cognition are being used, the hybridization of allied sciences is taking place, new trends of experimentation are being born at the interface of many disciplines. These interfaces are at present the specific sources of the development of biological knowledge.

The above mentioned factors are changing the very principle of the organization of new sciences but also the development of old traditional scientific disciplines. The trend towards the synthesis, the unification of many scientific disciplines and their methods for the solution of complex problems is becoming ever more explicit. The systems approach is becoming an important methodological principle in the study of life processes. All this provides new stimuli for its development, leads to the immense accumulation of the volume of biological information and the rate

of its growth. The basic principles of biology are being resolved in this qualitatively new situation.

At this level of development and in the near future the science of biology will have an even more important status even with regard to the solution of many practical /technological, production, therapeutical, transgenous, eugenic/ problems. In linkage with practice the biological sciences are becoming an important driving force of social development. The growth of scientific and technical knowlege is giving rise to a very serious problem, namely to the problem of mastering, theoretically processing and didactically arranging this immense amount of information which has accumulated in the last decades. This is linked not only with the content of instruction but mainly with the problems of teacher pre-service and in-service education.

The need of systematically acquainting teachers with new contributions of scientific research be it subject research or research in the field of methodology is becoming ever more urgent.

The present concept of in-service teacher education proceeds from the necessity of the in-depth solution of the relationship between theory and practice in the teaching profession. The education of biology teachers is thus a mediating link between theory and the practical work of the teacher.

The basic postulates of the concept of in-service teacher education include the general instructuring of the educational system in such a manner as to make it correspond to the ever more demanding requirements of the advanced socialist society and trends of development. Teacher training must comply with the demanding tasks of the socialist school. Teacher education does not end with graduation but continues in forms of in-service, life-long teacher education.

The unified system of in-service teacher education has been developed on this basis in such a manner as to make the different forms and levels complementary in content and organically integral.

The in-service education of biology teachers is currently extremely demanding, it requires personnel, organization and institutional safeguards.

Institutions which provide teacher education may be classified into five categories:

1st category comprises schools of all types and levels. Teacher education is synchronous with educational work.

2nd category comprises institutions deliberately established with the aim of in-service teacher education, namely the Central Institute for Teacher Education in Bratislava and the Central Institute for the Education of Educational Personnel in Prague. Specific institutions for in-service teacher education are differentiated by regional competence and authority in relation to different teacher categories. They include district pedagogical centres and regional pedagogical institutes, for biology teachers their respective biology departments.

3rd category comprises institutions of higher education /colleges of higher education and science faculties/ providing pre-service and in-service education of teachers.

4th category comprises institutions and organizations which educate teachers outside of the actual educational system: they include political and public organizations, scientific institutes and scientific societies.

5th category comprises auxiliary institutions and installations, such as television, radio, the press and institutions which develop and produce educational media.

In-service education of biology teachers consists of three basic stages:

- induction of beginning biology teachers,
- post-graduate study
- specialization study.

Next to the said three stages biology teachers can attend various forms of study courses depending on their post, work assignment and type and level of school at which they teach. This is the functional study of school administrators /heads, deputy heads and inspectors/, and the functional study of regional and district methodologists, etc.

Induction of beginning biology teachers

Under instruction issued by the ministeries of education of the Czech Socialist Republic and the Slovak Socialist Republic the central institutes for teacher education have drawn up a ge-

neral programme of the induction of beginning teachers. The programme proceeds from the general objective of the education of teachers in a socialist society and from the specific needs of beginning teachers. The induction process consists in the creative application of biology knowledge acquired in pre-graduate study, in complementing the system of basic educational skills and in deepening the responsible attitude of the beginning teachers towards young people, to educational and public work.

The programme of the induction of beginning teachers has three basic components: ideological and political, general educational and methodological /subject teaching/. The former two have a common content for teachers of all subjects. The subject teaching component is differentiated by school type and level and by the teacher´s specification.

The beginning teacher is guided by his tutor, the school head and his deputy and by the subject commission. Immediately on assuming his post the beginning teacher becomes acquainted with the tasks and plan of the biology subject commission. He learns to keep pedagogical documentation, to correctly draw up educational thematic plans for those classes where he will teach biology and to correctly prepare for his lessons. The tutor instructs the beginning biology teacher about the correct use of various aids, about the choice of the appropriate aid for the respective lesson, he acquaints him with the operation of educational media and tests his skills in this respect. He acquaints the beginning teacher with the reference library for biology and teaches him to study specialized and educational literature and specialized educational periodicals. The beginning teacher becomes acquainted with the biological olympiad and with the work of interests and hobby groups. Induction also contains basic regional knowledge of nature and environmental control.

Induction basically consists in visits and the analysis of lessons, individual consultations with instruction and discussions on selected themes.

The beginning teacher will during one year cycle observe 12 - 15 lessons of his tutor and will attend all actions organized by the biology subject commission and by the biology departments of the regional educational institute and the district pe-

dagogical centre. The tutor and school head will visit at least 8 - 15 lessons of the beginning teacher.

Post-graduate study

Post-graduate study is part of the educational system and follows up by its educational objectives on pregraduate higher education forming with it a comprehensive entity in content and structure. This educational process takes two years and contains three basic components:

a/ ideological and political

b/ pedagogical and psychological

c/ subject component which comprises specialized study of both subjects of the combined specialization, namely the following study fields: biology - chemistry, biology - geography, physical education - biology, mathematics - biology.

Biology instruction within post-graduate education is implemented in form of semestral consultations and summer block courses. Curriculum development maximally respects the choice of the most topical themes as concerns the new content of secondary school education with emphasis on latest knowledge, such as has been acquired in biology and with which the post-graduate students shd not become acquainted during their pregraduate education.

The curricula contain four thematic units: botany, zoology, human biology, general biology. They are innovated on an annual basis.

In the theory of biology instruction the attendees are acquainted with the latest instructional methods and forms of work in the educational process in compliance with the requirements placed by present socialist school and at the level of present science.

In view of the fact that moder educational media are a significant component of the rationalization of the educational process the attendees are given the opportunity to independently operate modern instruments and laboratory equipment which is used in secondary school instruction. This will allow teachers to efficiently use this equipment in classroom practice.

Post-graduate study is terminated with a final examination which includes a written thesis.

The themes of the final theses in all subjects are made available to the attendees and are chosen such as to enrich the subjects with new knowledge with the aim of using this new knowledge in the instruction process.

The final theses are assessed by the tutor and the reviewer from the ranks of staff members of the respective university department. The final examination takes place before a commission.

Specialization study

Specialization study has been introduced as the third stage of the life-long education of teachers. Together with induction and post-graduate study it forms a unified entity and is the pinnacle of the professional preparation of teachers for their educational work. Central institutes for teacher education are introducting specialization study courses in stages.

For biology teachers specialization study courses for school health instructors are being organized. The study course is oriented to overcoming certain shortcomings in the field of school health education. Its objective is to provide teachers with basic knowledge and skills in the preventing care and health protection, the protection of the working and living environment in the school and in its environs.

Specialization study of instructors of paramilitary education does not directly affect biology teachers, it may also be attended by teachers with any other specialization. It does, however, contain certain themes which are based on biology, such as first aid.

The second stage will incorporate the study of induction tutors and trainers. The curricula of the study course proceed from demands placed on teacher tutors and trainers, namely a high ideological and political standard, a knowledge of innovations in the life sciences, the application of progressive forms and methods in the educational process, a mastery of laboratory technology.

The aim of specialization study of the heads of biology subject commissions is to extend and deepen their knowledge in the ideological and political, pedagogical, subject teaching and management spheres in compliance with the needs of the respective school. The fundamental subject teaching /methodology/ problems

of biology incorporate the content of biology instruction with regard to the concept of the Project of the Czechoslovak educational system in schools of the first and second cycles, i.e., the basic postulates of the new concept of biology instruction.

With regard to the singular importance of extracurricular and after school activity of pupils following from the requirements of optimizing the polytechnical character of the school, and practical everyday life and because we have not specially trained personnel for after-school activities the need has arisen of developing the content of specialization study courses for biology teachers oriented to extracurricular and after-school work and the instruction of elective and optional subjects: biology seminars and practicals, health care, plant and animal breeding, nature conservation, groups of young naturalists.

The aim of the study courses is to provide the teachers' with a knowledge of extracurricular and after-school activities their forms and means in biology and the deepening of this knowledge of possible forms of work in pupils' hobby groups and in lessons of elective and optional subjects. The curricula underpin the goals and tasks of biological olympiads, the polytechnical principle in biology instruction, environmental care, zootechnology and botanical technology, the acquisition and processing of zoological material, the preparation and equipment needed for excursions, plant and animal breeding.

The specialization study of biology teachers is also oriented to the biological aspects of environmental control which is motivated by the need to deepen the teachers' knowledge and by the broad publicity given to the said problem.

Education of biology teachers with regard to the needs of the content restructuring of the Czechoslovak educational system.

The ministries of education of the Czech Socialist Republic and of the Slovak Socialist Republic are devoting maximum attention to the content restructuring of the Czechoslovak educational system. The gradual introduction of the new content of education can only be secured by the purposeful and systematic enhancement of the ideological and political, methodological /subject teaching/ and subject education of teachers. The effort of all institutions involved in the in-service education of teachers is therefore being oriented to the education of teachers for the new concept of forms and methods of work in the school, for work with the new content, in compliance with the new curricula and text-books.

In the natural sciences the teachers were acquainted with the new content of the curricula and text-books as well as with the educational importance of elementary science and natural science in the primary school curriculum. It was necessary that they should come to understand that the modernization of the new concept of this subject lies not only in content changes but primarily in the methods and forms of the teacher´s work with the pupils. These forms and methods have a high activity effect and can thereby contribute towards a more profound acquisition of new knowledge by pupils. The function of the teacher is to consist to a major extent in controlling the independent work of pupils. Observation, comparison, experiment and work with the text-book, identification handbooks and the literature in general. It became necessary to remove the encylopedica character of instruction and to develop this knowledge by independent work.

At this point it is not possible to explain the principles of the new concept of educational work in natural sciences at primary level. Older teachers will have to become acquainted with subject innovations whose consequences reach primary level subject matter. Senior educational personnel /non-biologists/ who assess the work of the teachers were acquainted with modern methods and means which are currently being applied to provide that their assessment should be correct.

In view of the large number of science teachers a relatively

complex organization of their education for the new concept had to be developed. In the regions /according to proposals put forward by regional biology methodologists/ 6 - 8 member groups of regional tutors were set up who were trained at the so-called tutorial centres since 1978. The study courses were directed by the authors of curricula and text-books, and by science methodologists. The schooling took four years.

In the first year the study course was oriented to the content of the subject as a whole and to the methods and forms of work. The subject matter of botany in the fifth grade of primary school was studied in detail. In the following years the study course was oriented to the subject matter of primary school science. Regional schoolings were organized in cooperation with tutorial centres, organized by district bodies. At present the education of all biology teachers for all grades of primary school has been completed.

The fulfilment of this demanding task will be followed by continuous in-service education which will last three years and will have a compensation function. It will be aimed at deepening the knowledge and skills of teachers acquired in their preparation for the new concept. The teachers will be given the opportunity to consult each other and to exchange experience. This cycle will become the transition to systematic, longterm education of teachers. It will be implemented through regional pedagogical institutes and district educational centres and through school subject commissions. The content of this study is divided into the compulsory and the elective parts. It will be lead by tutors who have been proven in the preparation for the new concept of science instruction in basic school and who will form permanent consultative bodies for the respective specialization.

At present the most topical task is the education of educational personnel for the new concept of all three types of secondary school whose implementation is in its initial stage. The new concept will be introduced in the first grades of secondary school as of September 1984. Training for the new concept will involve not only grammar school teachers but also teachers of certain secondary vocational schools /agriculture, forestry/ and secondary vocational training centres /gardening/ where biology is

taught as the main subject. The aim of this teacher training is to acquaint the teachers with the new concept of the subject and to help bring the three types of secondary education closer to each other, all this within the intents of the document on the further development of the Czechoslovak educational system. The thus trained teachers will be able to teach at all types of secondary schools without any problems. By this study they are to acquire a good knowledge of biology at the level of the current state af this science, to acquire appropriate methods and forms of work aimed at increasing the activity od pupils, to come to understand the relations between the subject and its content, methods and forms with a view to forming the personality of the pupil, etc.

In-service training for the new project is divided into three stages. The first two stages will be common for teachers of all three types of secondary schools, the third stage will be specialized for the respective type of secondary education. The first stage is oriented to subject innovations, the second to innovations in the specificities of biology subject teaching. Both stages will be completed at all schools by September 1, 1984.

The third stage is oriented to the methodological analysis of text-books, i.e., of selected thematic units by grades and with regard to the work of the teacher in a concrete type of school. Model observations will be included in this stage.

A handbook in two volumes has been prepared for teachers attending this type of in-service education which contains the training curriculum, control questions and problems, as well as references to study literature. Articles related to teacher training are also published in the journal Přírodní vědy ve škole /Natural Sciences in the School/ and in other periodicals published for teachers. Biology teachers may prepare for this schooling. Central Institutes for the education of educational personnel set up tutorial centres for regional tutors who are recruited from the ranks of heads of biology department of regional pedagogical institutes and teachers whom these heads of departments have appointed /most frequently from the ranks of teachers at experimental schools/ and by other specialists. Training for the new concept will be terminated with a final interview.

The described demanding training is spread over four years. After the said four years teachers will attend basic in-service education study courses divided into the above described three stages and legalized in Decrees issued by the ministries of education of the Czech Socialist Republic and the Slovak Socialist Republic on October 26, 1977 and relating to the unified system of in-service teacher education.

3.3.2 Selection of communications presented in the discussion

Taking the floor in the discussion in the biology working group was M. L e n o c h o v á who spoke of the didactic system of biology and its impact on the in-service education of teachers.

The author of the communication stated that the reconstruction of the Czechoslovak educational system is setting many demanding tasks to the didactic systems of all subjects. It has therefore been necessary to develop such a concept of subjects which would make it possible to increase the effectiveness of the educational process with regard to the requirements placed by our society on the education of the young generation in the period of the building of an advanced socialist society.

The new didactic system of biology was developed on the basis of developed adequate pedagogical and psychological concepts related to the objectives of the present educational process and on the basis of the analysis of the scientific system of biology.

The author presented an analysis of the didactic system of biology for the first and second levels of basic school and for grammar schools. The choice and arrangement of the content of the said system took into consideration the following aspects:

a/ educational tasks,

b/ the current state and trends of development of biological sciences and their applicability in social practice,

c/ the rules of the work of the teacher and pupil and their effective control,

d/ previous biology education of pupils,
e/ specific pedagogical and psychological characteristics of pupils of certain age group,
f/ the relationship of biology and other natural sciences.

The characteristic feature of this didactic system is the spiral arrangement of the individual components. On the basis of this arrangement the subject matter of every lower level becomes the basis, the introduction to any higher level in the instruction process, a postulate which the teacher will follow up on and which will allow him to provide the pupils/students with new knowledge, to inculcate in the pupils the understanding of interrelations between the different subject areas, themes, thematic units and finally to give them a good knowledge of the whole structure of the subject. During the instruction process all important notions are repeated, always at a higher level of cognition, they are deepened and specified.

The author of the communication went on to deal with the new concept of biology subject matter in the grammar school. This concept puts emphasis on general biology, which by its general character and philosophical impact has basic importance for general education and for education for the scientific world opinion. This new concept has been developed into curricula, text-books and methodological /subject teaching/ handbooks. The new project of biology instruction was developed for the new model grammar school on the basis of theoretical postulates and had to be experimentally tried. The aim of the research was to verify empirically and theoretically the said hypothesis and to develop such a model of biology instruction for the grammar school which would best correspond to the social function of this school. The experiment was organized in 10 schools in the Czechoslovak Socialist Republic on a sample of 300 secondary school students. As against traditional instruction the model lessons emphasised the formative function of the instruction process, the system and structure of the content of education with regard to the continuity of education and to training for practical life, the acquisition of habits and skills for theoretical and practical work.

The confrontation of the results of knowledge tests with the set partial educational goals showed that the expected results had

not been achieved, said M. Lenochová. One factor which influenced this process was the actual content of the subject matter. Some themes proved to be relatively demanding, extensive or inadequately developed from the didactics point of view. The teacher is an equally important factor in the instruction process. The formative aspect should prevail in the instruction process. It is demanding on time but is indispensable for the development of the personality of pupils.

Practice has shown that most teachers have acquired a certain amount of knowledge and that they are striving to access this total amount of knowledge to their pupils. This method of instruction does not create adequate space for pupils' initiative and independent decision-making. It will therefore be necessary to underpin this aspect of the instruction process to all teachers both within the framework of pre-service and during in-service education, concluded the author.

A very interesting communication was presented by J. P i a s e c k a of the Polish People's Republic who discussed the diploma theses of teachers attending distance in-service training courses. The diploma thesis is the final stage of study. It is an example of the didactic work of the teacher who is upgrading his qualification and is also an example of the cooperation between the university teacher and the primary and secondary school teacher. At present the author and her colleagues are devoting great attention to the research of instruction methods and instruction media in biology. Within the framework of these research projects experiments are planned and implemented whose objective is to determine the level of the applicability and suitability of the so-called simplified biology figure in biology instruction and biology study. This is a schematic drawing in which is encoded the information which together with the verbal code specifies the information.

The author demonstrated this on the example of a concrete diploma thesis which dealt with the functions of the simplified schematic biology drawing the presentation of the subject matter: Vertebrae in the fifth grade of primary school. The results of the experiment in which the pupils used the schematic drawing was demonstrated by the author on tables which compared the class

which had used the drawing with a control class which had not. The results of the comparison show that the method is effective and in pupils has aroused great activity and great interest in biology.

The results of another experiment were presented by M. P i t r o w i c z of the Polish People's Republic. She presented the results of a research project carried out in 24 schools in southern Poland by the Department of the Didactics of Biology of the College of Higher Education in Cracow which was focused on the formation of the skill to correctly organize the process of learning natural sciences.

In the process of learning natural sciences an important role is played by the knowledge of the methodology of natural sciences and of the principles of the psychology of learning. The research was conducted in 6th grade primary school pupils. In experimental classes the teachers acquainted their pupils with the principles of the methodology of natural sciences and taught them to apply these principles in learning natural sciences. The research was focused on:

- the pupils' work with biology related texts
- learning through biological observation
- learning by biological experiments
- learning through discussions, and from popular lectures.

Tests were used to verify the results of the experiment. The tests showed the learning knowledge and skills of the experimental sample. The tests which were developed by the author of the communication are original research tools. The results of the tests demonstrated beyond any doubt the higher learning knowledge and skills of the experimental class as compared with the control class.

3.3.3 Conclusions and recommendations

The task of the biology working group at the international seminar on in-service education of science teachers was to discuss at three sessions a number of set thematic areas and from

the conclusions of the discussion, comments and suggestions presented by the members of the working group to recommend possible measures for improving the in-service education of biology teachers.

The discussion was oriented to the following thematic areas

a/ the aims and didactical concepts of the life-long education of science teachers,

b/ the implementation of the concept of the life-long education of teachers,

c/ possibilities of cooperation in optimizing in-service teacher education.

The communications centred on:

1. the current state, forms and prospects of increasing efficiency of the information system for improving the work of teachers. Underpinning the aspects of motivation and process in its concrete implementation in teaching practice. The importance of this problem area was borne out by the high number of communications presented in the discussion. Many of those who took the floor in the discussion pointed to the serious shortcomings in the post-graduate education of teachers in which they are inadequately acquainted with the possibilities, forms and means of acquiring information.
2. the specification of the content, method, forms and means of the concept of in-service teacher education based on suggestions, proposals, recommendations and experiences presented not only by Czechoslovak but also by foreign participants in the seminar:

   a/ problems were discussed relating to in-service education and its relationship to motivating interest in the teaching profession - this is mainly a matter of basic research;

   b/ proceeding from comments made by the majority of participants the view was generalized relating to the necessity of achieving a proportionality of psychological and pedagogical education on the one hand and subject education on the other at teacher training colleges and universities in compliance with the demands of the present period. It was generally stated that the pedagogical and psychological education of teachers is inadequate, in many cases it

is not up to present demands.

3. The problem was discussed of coordinating publishing activities - in some regions there is duplicity in the development of instruction materials - and of the significance of correspondence courses which should become a permanent system.

The following recommendations were made:

1. to provide regular innovatory information to teachers relating to the subjects which they are teaching at minimally five year intervals - if the character of the subject and the development of the discipline should require this interval should be shorter.
2. to establish working groups from the ranks of faculty staff of universities, academies and all teacher training faculties and colleges headed by staff members of central institutes for the in-service education of educational personnel, for preparing editions in the respective fields of study.
3. to establish a working group for determining the didactical and methodological criteria to be applied to the selection of information from the different science disciplines relevant for teachers. To conceive connections to specialized information centres. Within this task to study the problem of providing adequate and well-founded information for the needs of teachers and for incorporation in the curricula of the respective school type and level. To distinguish information for teachers and pupils.
4. the first experimental project should be the establishment of a data bank of methodological instructions for laboratory work /tasks and experiments/, to develop a series of projects related to the theme or thematic units, to establish concrete criteria of demands on folow-up, material, time, knowledge, interdisciplinary relations, etc.
5. to secure the centralized filing of methodologically oriented diploma, doctoral and other theses submitted in in-service study courses of various forms, educational readings, by theme, application means, etc. To set up a group which will discuss filing conditions.
6. to establish a central inventory of teaching aids oriented to teacher training with regard to conditions of use, exacting-

ness /material, time, etc./, production conditions, etc.

7. to recommend the establishment of a unified system of the education of educational personnel within the educational system and in cooperation with the other sectors /production/ and to inform in advance faculties training for the teaching profession of the programme of the production of educational media.
8. to recommend to all member states to integrate in the in-service education of science teachers the following problem areas:
   a/ environmental education /the protection and creation of the environment, peace education /follow-up of Unesco project/
   b/ to emphasise in the post-graduate and in-service education of teachers problems related to the philosophical and methodological aspects of biology instruction,
   c/ to enhance subject, didactical and psychological aspects in in-service teacher education. Of the methodological and didactical aspects to emphasise intellectual activity - relations between notions previously acquired, interdisciplinary relations, the use of the transfer of acquired knowledge to new situations and its practical application,
   d/ in in-service teacher education to establish suitable organizational and economic conditions and the necessary motivation for rationalizing post-graduate and in-service teacher education.
9. to recommend the respective analysis of existing curricula of in-service teacher education and their modification in the sense of point 8.
10. to recommend and recurrently organize according to need central courses of informatics for directors of departments of district pedagogical centres and librarians. Such study courses should be oriented to educational practice.
11. to recommend the establishment of information centres in educational libraries, oriented to educational practice.
12. to consult the concept of bibliographical publications with the staff of pedagogical institutes.
13. to recommend the elaboration of methodological handbooks for schools of all levels containing a survey of new notions and relations, interdisciplinary relations, aids, reference literature and their educational uses and practical applications.

14. to enhance the use of foreign methodological sources, such as periodicals and non-periodical publications for the prompt information of teachers through pedagogical journals.
15. to devote greater attention to the selection of grammar school graduates for the teaching profession.
16. to increase and enhance the socio-economic aspect of the teaching profession.

## 3.4 WORKING GROUP FOR IN-SERVICE EDUCATION OF CHEMISTRY TEACHERS

3.4.1 The introductory paper was presented by Doc. RNDr. M. M i a d o k o v á , CSc., Chairperson of the working group

In-Service Education of Secondary School Chemistry Teachers

In view of the continuous progress in the field of natural sciences and with it the related rapid technical development, education and the consistent acquisition of new knowledge should be considered as a natural phenomenon in every human being. For educationalists this process is evidently inevitable and is different in that it must be coped with at a much higher level because the teacher is not only a consumer of new ideas, knowledge or technical progress but also the direct mediator and disseminator of such knowledge. The teacher must therefore learn and acquire new knowledge in such a manner as to be able to access it and provide it for acquisition to others.

The educational process is the key question in every state and nation because it directly and indirectly influences the cultural, technical, economic and social level of the population. As such it must obviously keep up with cultural scientific and technical progress. Regardless of changes, modifications, amendments or reforms of the educational system the teacher is the main factor in their implementation and thereby also the most important factor. The teacher´s preparation for this responsible function is a long-term professional matter.

Complete professional training of educational personnel for educational work must today be conceived as comprising at least four stages of education, namely pre-graduate education, i.e., initial higher education, and three stages of in-service education, starting with induction. The programme of the induction of

beginning teachers proceeds from the general objectives of education of teachers in a socialist society. The essence of the induction process is in the creative application of specialized knowledge acquired at the respective institution of higher education, in the development of educational skills and in deepening the responsible attitude of the beginning teacher towards youth, pedagogical and public work.

The induction programme consists of three basic components: ideological and political, general pedagogical and methodological - the first two are common for teachers of all subjects, the methodological component is differentiated by the type and level of school and by the teacher's specialization.

The substance of induction is observation and analysis and individual consultations with instruction and discussions on selected themes. In the course of the one year induction period the teacher will observe 12 - 15 lessons in his tutor's class and will attend all activities organized by the respective subject commission and department of the district pedagogical centre and regional pedagogical institute. The tutor and the school head or his deputy will make 5 - 15 visits in the beginning teacher's class.

The second stage is post-graduate education which takes place after several years of service and takes two years. The subsequent stage of the system is the so-called specialization study which is characterized by its monothematic orientation of content which makes it different to all other types of in-service teacher education which are oriented to all components of the teacher's education simultaneously. Specialization study is to deepen one part of the teacher's specialization according to the needs of the school and interests of the teacher. In content it is oriented to:

a/ specific pedagogical activities /such as teacher tutor, teacher in a demonstration school, school-counselor, head of interests or hobby groups, instructor for educational media, etc.

b/ training for publishing activity in the field of education,

c/ deepening the teacher's knowledge and upgrading his educational work in one subject of his combined specialization.

We shall now deal with the problems of post-graduate educ-

ation which is the oldest form of in-service teacher education and where there are many views and much experience.

The post-graduate education of teachers in the Slovak Socialist Republic has been taking place for more than 10 years and is the logical result of the development of science and technology which requires continuos updating, broadening, and innovation of knowledge both in the natural sciences and in social science disciplines. It follows up on initial pre-service education, i.e., on the teachers' knowledge acquired in the subjects of their specialization, in psychology and pedagogy and in socio-philosophical field, as well as on several years of practical experience.

Since its very beginnings, i.e., from the years 1966 - 1967 when it was launched as an experimental project, it has undergone a certain development both as concerns content and organizational forms and methods of implementation. It should be said that the very concept, aims and content of post-graduate education indicate that it will continue to develop even in the future. The content of post-graduate education will have to keep up with new demands and needs which will require amendments in forms of implementation. There already exists material for its evaluation within the system of teacher education and these documents will provide an orientation for modernizing the system.

It should be emphasised that when introducing any changes and any modernization we have to realize that in post-graduate study courses we are dealing with people whose profile has been formed in pre-graduate education and who have for five or more years fixing working habits, have been upgrading and updating their knowledge as was required by their practical work and let us admit that these people have mostly lost contact with their alma mater. They have the oppertunity and moreover the obligation to return to their alma mater for a post-graduate study course for a period of two years. During the said two years they should deepen, broaden and innovate their political, subject and pedagogical knowledge. This means that they should become acquainted on a higher level and in depth with that knowledge which is nearest to their pedagogical practice and with the development of their disciplins. They should realize the gaps in their know-

ge, shortcomings and should correct any possible incorrect stereotype in their pedagogical practice. Last but not least they should gain an impulse and desire for further upgrading their knowledge of their respective discipline and of their general educational level.

The subject commission for post-graduate education of chemistry at the science faculty of Comenius University in Bratislava has been working for many years in the spirit of these aims and principles. Very often, practically on an annual basis, we checked the content of the study course and incorporated thematic units which were most closely related to the needs of the teachers, respecting new criteria and new concepts.

Already during the first cycle of post-graduate education within the summer block course the attendees are given the opportunity to become acquainted with modern didactical techniques and within seminar theses are able to verify the correctness of their didactical and methodological approach, possibly to correct it.

Factors of initiative and stimulation are contained in the final thesis, this both in the actual choice of the theme, in the work and in the final form of elaboration. A correctly chosen theme and its correct, i.e., informal concept may become beneficial both for the attendee's personal development and for the social function of the thesis. It will thus help the teacher in his effort to produce workers better equipped for practice and more capable future university and college students.

Chemistry and the study of chemistry provides certain specific possibilities both as concerns the choice and the elaboration of the final theses. Insofar as the chemistry teacher not only teaches chemistry but also demonstrates chemical experiments it will certainly be useful if he uses the post-graduate course not only for improving his theoretical knowledge but also for gaining new stimuli and acquiring the knowledge of new experiments aimed at developing creative thinking in the pupils and adapted to the technical standard and equipment available in the respective school. The post-graduate study course should also serve as a criterion of the attendee's ability to gain the RNDr. /Science Doctor/ degree.

Finally I would like to emphasise the extreme need of suit-

able and especially available literature. The fact that any form of in-service teacher education should and is centred on independent study is directly linked with the necessity of providing attendees with suitable literature, citations and sources. The institution of higher education, i.e., its publishing commission should permanently incorporate in their publishing programme not only the publishing of literature specially designed for in-service teacher education but should also publicize literature which should provide teachers with answers to questions which are not adequately answered in available book literature.

Insofar as chemical disciplines are concerned it should be stated that inorganic chemistry has ceased to be a set of facts on the properties of substances arranged according to the position of elements in the Mendeleyev periodic system. It deals with the properties of substances and explains these properties on the basis of their relations to structure and bond type. From this point of view the content and the literature designed for various forms of post-graduate study courses should be oriented in such a manner as to emphasise: 1. relations between the electron configuration of atoms and their reactivity, 2. quantum mechanics theory of chemical bonds, 3. crystallochemical aspects, 4. relations between the structure of substances and their properties.

Organic chemistry is mainly oriented to the quantification of phenomena on the basis of reaction kinetics and thermodynamics as well as of empirical experience of how a certain group in the molecule affects the reaction centre in this molecule. There is also the solution of mechnisms of reactions, in organic synthesis the preparation of substances with assumed physical, chemical, possibly biological properties. Another problem it the wider use of computers.

In general it may be said that the said trends in chemistry reflect a higher degree of exactness and logical deductions from which directly follows the preference of acquiring physicochemical disciplines such as thermodynamics, chemical kinetics, the science of the structure of substances and quantum chemistry.

Modern trends in chemistry should form the content of various degrees of post-graduate education and should also be suitably dealt with in texts designed for in-service education.

Such an approach to the broadening, deepening and innovation of chemistry knowledge, together with basic knowledge will allow the teachers to acquire the skill to generalize the properties of different elements and compounds, to explain their gradual changes, possibly their seeming anomalies. Such a dialectical approach is directly linked with the development of the aptitude of logical thinking and cognition.

It will also be necessary to modernize the organization of post-graduate education. Weekend block courses in the winter and summer semesters such as had been run so far are not suitable and do not yield the desired results.

Teachers' response /inquiries and interviews/ and long-term practical experience have shown that the programme of in-service teacher education should be distrituted into cycles and that compulsory and elective forms should be distinguished in any such programme. Moreover the type of the school and the length of service should be taken into consideration.

1. The compulsory form should comprise the existing first stage of in-service teacher education, i.e., induction. This type of study should be focused especially on the methodology of the instruction process. The second stage should be post-graduate study organized at the respective institution of higher education with the aim of deepening and innovating subject and pedagogical knowledge with regard to the needs of the educational practice of the teacher.
2. Elective study should comprise a wider range of forms:
   a/ specialization study containing several categories oriented to the special needs of the school and implemented in study course form,
   b/ education within the framework of the school pedagogical chemistry commission and incorporating the study of specialized, pedagogical and political literature, this both books and journals,
   c/ attendance at lectures organized by the Czechoslovak Chemical Society, regional pedagogical institutes, the scientific and technical society, etc. Attendance and exchange of experience at national chemistry conferences, symposia and congresses,

d/ excursions oriented to a certain type of production, possibly to research, depening on the school locality,

e/ graduates of our universities and of other institutions of higher education should be given the opportunity to establish closer contact and cooperation with their alma mater. This could be mutually beneficial.

In conclusion I would like to state that any form of postgraduate education should improve the existing profile of the secondary school teacher.

3.4.2 Selection of communications presented in the discussion

A. Ďurďovičová presented a communication on the contribution of the Pedagogical Institute of the City of Bratislava to the in-service education of chemistry teachers.

She first spoke of the tasks of the institute and their fulfilment. For the reconstruction of the content of secondary school education the Institute is training teachers in three fields:

- general ideology, and pedagogy and psychology
- subject,
- methodology.

The Institute cooperates with institutions of higher education training for the teaching profession in the fulfilment of these tasks.

The Institute takes part in improving the education of chemistry teachers for secondary vocational schools in relation to the new concept of education. It provides methodological and specialized assistance to schools in the establishment and equipment of resources centres, specialised classrooms, laboratories. This field of activity is most urgent because until recently chemistry had not been taught at some vocational schools.

The Institute runs seminars, training courses, schoolings, model lessons, excursions to selected schools, to international exhibitions /e.g., Incheba/, it organizes showings of scientific and technical films.

A very effective form of the methodological guidance of

teachers, especially of beginning teachers, are individual consultations, visits of their lessons, organized group visits to other schools. Great attention is being devoted to methodological procedures oriented to instruction of basic concepts of general chemistry, to the consistent use of new chemical terminology.

In view of the fact that accessible pedagogical literature does not at present fully cover the needs of educational practice we are devoting increased attention to the development of the teachers' creativity, namely by:

- recruiting authors of educational readings,
- publishing in the bulletin Bratislavský učitel /Bratislava Teacher/,
- publishing methodological materials.

One of the most important forms of the creative work of educators are educational readings which contribute to the creative solution of problems relating to the educational process and provide the educators with the opportunity to exchange practical experience.

The bulletin Bratislavský učitel offers ample space for publishing brief materials, good experience and the results of the work of schools and teachers and information on the work of basic and secondary schools.

As concerns methodological materials the author cited the titles of materials which have been published or are being prepared for print and added that not even these materials, seminars, model lessons or schoolings can provide teachers with a clearcut guideline for work, that sufficient space must be left for creative educational work and the systematic independent study of pedagogical and subject-related pedagogical literature.

The questions of education for creative work in the in-service education of chemistry teachers was taken up by T. L i p t h a y .

Today's teacher, he said, should be creative. This means that he must not only have a good knowledge of the principles and laws of pedagogy, psychology and the related sciences but that he must be able to creatively apply these principles in the teaching process.

The formation of the teacher's personality is a long-term

process. The teacher's personality is formed already during initial training at university of college. It is usually typical of beginning teachers that at first they are more likely to imitate models and more or less mechanically apply subject-related and pedagogical knowledge. The sooner the young teacher departs from imitating and begins working creatively the quicker he will gain educational mastery.

Education for creative work should be conceived as a permanent and life-long process with special goals, content, forms and methods being set for each period and every type of work. It thus follows that education for creative thinking, for creative work is not only a task related to university education but within the framework of post-graduate study it also applies to the in-service education of teachers. Within post-graduate study teachers broaden, deepen and innovate their ideological, political, subject-related and pedagogical knowledge. It is, however, important to see to it that post-graduate education should motivate, enable and further develop the independent creative work of teachers. This is such a system of education for creativity which does not only involve training for problem solution, enhancing the teachers' association abilities and skills but which also contains a wide range of methods and opportunities for the development of creative thinking, creative activity and the interlinkage of the said methods.

The author presented some of the results which had been reached in the solution of the branch research project whose objective was to find the most objective method of accessing creative thinking and the creative potential of students with regard to chemistry instruction applying the notions of the psychology of creativity. A special test has been developed which has made it possible to monitor certain important factors of creative thinking, such as fluency, flexibility, originality, elaboration. With regard to creativity the position of all monitored factors is not, however, equally significant. It will therefore be useful for education for creativity in the different scientific disciplines to determine not only the criteria for the assessment of creative thinking but also the hierarchy of the individual factors of creative thinking for any scientific discipline.

On the basis of experience with the research results we can say that creative activity and education for it require solid subject-related knowledge, said the author and added that such subject-related knowledge has to be so firm as to become the basis for suitable motivation which will make it possible to strengthen the teachers' relationship to the scientific discipline and to selfinstruction.

The research results have shown that the amount of knowledge and experience gained during pre-service education often remains isolated, the students are not capable of using it in situations which require creative application. It is important to devote attention to education for creativity also in post-graduate education. Education for creativity should organically follow up on the educational programme of higher education. Continuity should be maintained and within post-graduate education the knowledge acquired during pre-service education should be fully applied and further developed.

The function of problems in didactical tests for the control of the educational process in chemistry was the range of problems discussed by M. V a s i l e s k á . The author dealt with ways of increasing the effectiveness of chemistry instruction based on regulating of the control activity of the chemistry teacher. Control of chemistry instruction requires a thorough analysis af the results of chemistry instruction.

The author presented data obtained in the research project which was implemented in the years 1977 - 1982. The objective of the research project was to find out how well the structure of the subject matter /thematic unit "Hydrogen" - subject matter for 1st year of grammar school education/ had been transmitted into the consciousness and behaviour of pupils. The state of the educational process in chemistry is objectively identified by a method which is objective, sensitive, accurate and which makes it possible to statistically depict and evaluate the obtained results. In this case the method of didactical tests was used. To be applicable the test must be constructed in such a manner as to measure the relationship between the target and feedback information and thus indicate the effectiveness of the educational process. The result of the survey showed that the "empiric-

al structure of the didactical test", i.e., empirically identified statistical dependence between the results of the measures of the didactical test, approximate the "hypothetical structure of the didactical test" /involving the assumed dependence between the solutions of the measures/. This follows not only from a well constructed didactical test but also from the actual educational process. The thematic unit "Hydrogen" has a dominant position in the chemistry subject matter. It is the first thematic unit relating to inorganic chemistry following units of general chemistry subject matter. The teacher are well aware of this and therefore use their pedagogical creativity in this field. The said research showed that it would be useful to use a greater number of motivation factors to make instruction texts better fulfil their control function, to allow the pupils under the guidance of their teacher to themselves actively arrange and form their system of knowledge.

In conclusion the author pointed out that chemistry teachers should within in-service education acquire an in-depth knowledge of some methods of pedagogical research, namely those which will allow them to control the educational process.

3.4.3 Conclusions and recommendations

Targets and implementation of in-service teacher education

In-service teacher education should become the basis for the struggle against professional conservatism. It is especially necessary to find suitable measures for didactical and subject-related education.

Subject-related education should prefer themes which would endorse the formation of the chemical image of the world underlining the relations chemistry - man - the environment, chemistry - man - society.

The importance of chemistry for social process /for securing resources of energy, raw materials, food and the environment/, to develop logical thinking and the ability of deducting from general chemistry laws. In-service teacher education should contain

modern trends in chemistry which should be suitably processed also in study texts.

Didactical education and training should give preference to the professional skills of the chemistry teacher and in this respect should also prefer activity to knowledge, e.g., the empirical procedure of cognition, experiments, models, the use of information media in instruction, etc. Special attention should also be devoted to upgrading experimental skills so as to make school experiments become the preferred educational means of the chemistry teacher.

Experience has shown that one-day consultations are not suitable and we therefore recommend that new organizational forms of in-service teacher education should be considered such as block study courses during the vacations. Another form could be correspondence courses, possibly in cooperation with television or other mass media. Also useful would be centres for the in-service education of teachers at institutions of higher education where teachers would not only go for consultations but also to work in laboratories.

We moreover recommend:

a/ the concept should be considered of in-service teacher education using international experience and cooperation,

b/ planned education of teachers for creative work should be introduced,

c/ attention should be devoted to the use of information in the work of chemistry teachers with the aim of the chemistry teacher being not only the consumer of information but also its source,

d/ in programmes of in-service teacher education space should be created for the development of activity methods, such as problem instruction, group instruction and other moder methods,

e/ in in-service teacher education we consider the motivation of attendees to be of singular importance; such motivation should proceed from the results of the research of conditions /social/ of teachers who come to attend in-service education,

f/ the programme of in-service education of chemistry teachers should be developed in close cooperation with the programme of the in-service education of other science teachers,

g/ participants in in-service teacher education should be acquainted with diagnostic methods so as to be able to use them to assess their didactic procedures. Such elements of creative activity should become the stimulus for increasing the effectiveness of pedagogical work.

# 4 THE RESULTS OF THE INTERNATIONAL SEMINAR

The results of the Seminar may by its conclusions be characterized as follows:

The participants in the Seminar exchanged theoretical knowledge and practical experiences in the pre-service and in-service education of teachers of the selected science subjects, namely chemistry, biology, geography and geology. They presented papers and communications relating to the given problem area and actively contributed their suggestions, comments and information in discussions which took place in the different working groups.

The analysis of the needs of science teachers emphasised the dialectic unity of pre-service and in-service education. The in-service education of science teachers is not a mere continuation of pre-service education, its extension or deepening. The teacher's experience, social practice, the objective influence of scientific and technical development and the changing demands placed on the educational system as a reflection of changing socio-economic conditions are creating a new quality.

The in-service education of teachers must reckon with the fact that the teacher who has theoretically mastered the laws of the educational process also experiences this process, albeit from the position of the subject but in continuous interaction with the object of the process, is qualitatively a completely different object of education than he had been in pre-service education. It was emphasised at the seminar that the concept of the in-service education of science teachers should reckon with this fact and should make appropriate use of it.

In the process of self-education every teacher becomes a teacher onto himself. In the process of educational practice the teacher gains educational practice which he analyses and generalizes, by self-education he strives to keep up with the pace of the development of science and culture and educational systems which changes his professional personality. Self-education is the basis of the in-service education of teachers and all else only has sense if it serves as systematic and purposeful help to the self-educating teacher.

The participants in the discussion pointed to the necessity of integrating world problems in the in-service education of teachers, this namely the problems of education for international

understanding and international cooperation, education for peace and disarmament, education relating to human rights and fundamental freedoms. The participants in the seminar agreed that environmental education is gaining singular improtance in the in-service education of science teachers.

Emphasis put on the interlinkage of the science subjects leads to the establishment of links between such subjects in education. In the concept of in-service education of science teachers this fact should be given appropriate emphasis and the teachers should be guided to deepen and strengthen the interdisciplinary relations between these subjects.

Adequate attention in the content structure of the in-service education of science teachers should be devoted to the problems of the teachers' work with information and the intensification of information education: the teacher as the user and author of information and as the mediator of information technology.

The analysis of the in-service education of science teachers and its individual components emphasised the dialectic unity of these components. Pedagogical theory generally recognizes that it is ever more important to create such conditions as would allow one component of in-service education to be dominant, this in compliance with the teacher's needs, with regard to the space and time limits given by the place and period of his work. In the in-service education of science teachers innovation and retraining have become the dominant components of the in-service education of science teachers.

It followed from the communications presented in the discussion that in the different countries of the European region in-service teacher education is increasingly oriented to the development of concept, this not merely the development of programmes, courses, curricula, methodology, etc., but to the complex development of in-service teacher education, to relations between the science of education and educational practice with regard to the role and position of the teacher. This trend may be described as being worldwide yet its intensity differs in dependence on the conditions of the respective country concerned.

On a world scale this trend was initiated by the 35th Session of the 1975 Geneva Unesco International Conference on Education

which dealt with the changing role of the teacher in a changing world and recommended that in-service teacher education should become part of educational policy and educational research and that greater attention should be devoted to the professionalization of teachers, that in-service teacher education should be linked with innovation efforts in educational systems and with the practical activity of the teacher in the school.

Towards the end of the 1970´s and in the 1980´s specialized literature contains adequate information on trends and prospects in in-service teacher education. This shows that countries are devoting increasing attention to and interest in the selection, training and in-service training of teachers and all educational personnel. Various structured systems of in-service teacher education have been established in different countries. In the countries of the socialist community there exist fully integrated systems which are part of the unified system of education. Information on in-service teacher education, especially in the countries of the European region provide materials which enable us to generalize the two types of in-service teacher education which have developed in dependence on socio-economic conditions prevailing in the respective country:

- highly coordinated systems of in-service teacher education in most countries of the socialist community,
- considerably diversified and flexible systems of in-service teacher education in the other countries.

In this connection it should be noted that in the countries of the socialist community singular attention is being devoted to in-service teacher education from the part of political and state bodies and that in-service teacher education has become an important problem area in educational policy. This was demonstrated at the seminar by participants from the Soviet Union, the Bulgarian People´s Republic, the GDR and by representatives of Czechoslovak authorities.

Despite considerable differencies in the concept and forms of in-service teacher education all systems which were discussed at the Seminar showed the same tendency, namely the effort for improving the work of the teacher. In the future it will be necessary to deepen mutual exchange of information on systems of in-

service teacher education and on its basis to strive for the recognition and use of the positive elements of the respective approach to achieve the overall upgrading of in-service teacher education in all interested countries.

Recommendations

At the close of their deliberations the participants in the Seminar adopted the following Recommendations:

1. To integrate in the system of in-service education of science teachers the aspects of global problems of development of humankind, namely:

1.1 education for international understanding, cooperation and peace, disarmament education and education relating to human rights and fundamental freedoms and rights of nations,

1.2 environmental education,

1.3 education for the critical assessment of information.

2. To systematically analyse the system of in-service education of science teachers in the country and to process and exchange on an international scale relevant information /studies/ on the results of such critical analyses.

3. To improve the system of in-service education of science teachers in the interested countries in diverse ways, namely:

3.1 to provide at minimally five-year intervals regular, selective, specialized, innovatory information for teachers relating to their respective subjects and depending on the character of the subject and on the development of the respective field of science, on innovations in the respective field, on the development of the organization, methods and content of in-service education of science teachers. For this purpose to organize working teams consisting of qualified faculty staff, staff of academies of sciences, research institutes and excellent teachers in the respective field who under the guidance of the interested organization would prepare regular editions informing of innovations in the respective field - in the socialist countries these are central institutes for teach-

er education;

3.2 to set didactic and methodology criteria for the selection of information for teachers in the respective fields of science. For this purpose to establish a working group to set such criteria and to resolve the follow-up of its activity on the activity of specialized information centres in the country;

3.3 to carry out experiments in the establishment of data bases of methodology instructions for laboratory work and if such experiments aresuccessful to gradually set up the respective data bases;

3.4 to establish the system of a central file of diploma theses, doctoral theses, research reports, etc., in the respective countries, such as related to various aspects of the in-service education of science teachers /in the countries of the socialist community also including educational readings/;

3.5 to set up an inventory of educational media and teaching and learning aids for the in-service education of science teachers in the individual countries;

3.6 to organize the education and training of teachers as users and authors of information such as would become an integral component of their in-service education;

4. To organize national meetings of science teachers and meetings with international participation with the aim of exchanging knowledge and experience in the organization, methods and content of in-service education of science teachers.

5. To improve the existing information system relating to the in-service education of teachers operated by the European Information Centre of Charles University for Further Education of Teachers, namely as concerns its selectiveness and the analytical assessment of information.

In conclusion the participants of the Seminar also recommended that institutions and international organizations, namely Unesco and organizations with information competence involved in in-service teacher education should assess the said recommendations and that they should possibly incorporate them in their programmes of upgrading in-service teacher education.

It was recommended to the European Information Centre of



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Charles University for Further Education of Teachers to publish a concise proceedings of the Seminar informing of presented papers and of conclusions arrived at by the working groups.

Supplement No. 1

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## "Inservice Training of Science Teachers"
## Bratislava, October 17-21, 1983

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Supplement No. 2

P r o g r a m m e
of the International Seminar
"Inservice Training of Science Teachers"
Bratislava, October 17-21, 1983

Sunday - October 16, 1983
Arrival of participants and their accommodation in the hotel Tatra and in the student hostel Družba in Bratislava

Monday - October 17, 1983

| | |
|---|---|
| 9.00 - 10.00 | Registration of participants<br>Visit to the Faculty of Sciences of the Comenius University |
| 10.30 - 12.00 | Briefing of heads of individual working groups |
| 12.00 - 14.00 | Break for lunch |
| 13.30 - 14.00 | Additional registration of participants |
| 14.00 - 14.30 | Opening of the Seminar by the Director of European Information Centre of Charles University for Further Education of Teachers, doc. JUDr. S. Petráček, CSc.<br>Address made by the representative of the Ministry of education of the Slovak Socialist Republic prof. Ing. J. Marton, CSc., Rector of the Comenius University PhDr. J. Kvasnička, DrSc. and Secretary General of the Czechoslovak Commission for Unesco doc. PhDr. L. Šmíd, CSc. |
| 14.30 - 15.30 | Organizational instructions<br>Keynote of "The tasks and aims of the education of science teachers" presented by prof. RNDr. L. Melioris, DrSc., Vice-Rector of the Comenius |

| | |
|---|---|
| | University |
| 15.30 - 16.00 | Break |
| 16.00 - 17.00 | Position papers<br>Doc. JUDr. S. Petráček, CSc. - "World problems and contents of the in-service training of science teachers"<br>PhDr. A. Auxt - "In-service education of teachers and its trends of its development in Czechoslovakia"<br>PhDr. H. Procházková - "Problems of information in the in-service training of science teachers" |
| 19.30 | Cocktail party for the participants of the Seminar |

Tuesday - October 18, 1983

| | |
|---|---|
| 9.00 - 10.30 | Papers presented in plenary sessions<br>V. A. Bajkova - "On in-service training of science teachers in the Byelorussian Soviet Socialist Republic"<br>W. Bünder - "Developments and trends of teacher education in the Federal Republic of Germany"<br>Doc. RNDr. P. Petrovič, CSc. - "Out-of-school activity of students as means for developing their talent"<br>PhDr. I. Grekss - "Role of the school principal in the process of the induction of beginning teachers" |
| 10.30 - 11.00 | Break |
| 11.00 - 12.30 | Working groups |
| 12.30 - 14.30 | Break for lunch |
| 14.30 - 16.00 | Working groups /cont./ |
| 19.00 | Cultural programme, visit to the Slovak National Theatre |

Wednesday - October 19, 1983

Excursion outside Bratislava

Thursday - October 20, 1983

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|---|---|
| 9.00 - 10.30 | Papers presented in plenary sessions<br>I. N. Petkova - "On the problems of optimization of the process of in-service teacher education"<br>D. Lahíry - "In-service teacher education in India"<br>L. Genkova - "Problems of the optimization of the contents and organization of the educational process"<br>R. Tobon - "In-service training of science teachers in Columbia"<br>H. Obst - "Problems of improving the quality of work of science teachers in the Institute for Inservice Teacher Education in Leipzig" |
| 10.30 - 11.00 | Break |
| 11.00 - 12.30 | Session of working groups, final proposals and recommendations |
| 12.30 - 14.00 | Break for lunch |
| 14.30 - 17.00 | Visit to the selected secondary schools in Bratislava |

Friday - October 21, 1983

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|---|---|
| 9.30 - 11.00 | Conclusions and recommendations presented by PhDr. M. Černá, CSc., the scientific guarantor of the Seminar<br>Discussion in plenary session |
| 11.00 - 11.30 | Break |
| 11.30 - 12.00 | Closing the Seminar by the director of the European Information Centre of Charles University for Further Education of Teachers |
| 12.00 - 14.00 | Break for Lunch |

Departure of participants

Supplement No. 3

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